Chapter 1

Strategy And Objectives

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1.1 Introduction

This report responds to the annual reporting requirements specified by section 224 of the National Defense Authorization Act for Fiscal Years 1990 and 1991 (Public Law 101-189), as amended by successive legislation up to and including section 244 of the National Defense Authorization Act for Fiscal Year 1997. A complete inventory of relevant legislation outlining reporting requirements is summarized in Appendix A.

The report describes the overall Ballistic Missile Defense (BMD) strategy and describes the distinct programs and projects included in the overall effort, addresses international participation in BMD research, discusses the certification status of compliance of planned development and testing programs with existing arms control agreements, and provides details of current and planned funding for BMD. Chapters 2, 3, and 4 describe the program strategy, architecture, and planning for Theater Missile Defense (TMD), National Missile Defense (NMD), and Advanced Technology programs, respectively; Chapter 5 describes the funding requirements of the BMD Program; Chapter 6 addresses ABM Treaty compliance; Chapter 7 addresses the status of international consultations; and Chapter 8 addresses efforts regarding countermeasures, as they relate to the current BMD program.

The reporting requirements related to the earlier Strategic Defense Initiative (SDI) program directed at a phased deployment of defenses to counter a massive Soviet attack have been carefully considered in developing the report, but are not specifically addressed since they are no longer required as per the FY 1997 National Defense Authorization Act.

As a result, three of the original FY 1990-91 National Defense Authorization Act reporting requirements relating to the earlier SDI mission were deleted in their entirety, while two others deleted language related specifically to that mission. Figure 1-1 provides a summary of the subsequent reordering of reporting requirements from their original FY 1990-91 designation to their FY 1997 redesignation as directed by the National Defense Authorization Act of FY 1997. Each current reporting requirement is detailed in Appendix A. Table 1-1 also identifies the chapter(s) in which each requirement is addressed.

In addition, the Congress introduced a new Program Accountability Report requirement, specified in Section 234(e)(1) of the National Defense Authorization Act for Fiscal Year 1996, which requires the Secretary of Defense to "describe the technical milestones, the schedule, and the cost of each phase of development and acquisition...for each core and follow-on theater missile defense program." Section (e)(2) requires the report to include a description of variances in the technical milestones, program schedule milestones, and costs compared to both (1) the report submitted the previous year and (2) the report submitted the first (initial) year. This report requirement is addressed within Chapter 2 as part of the detailed discussion of the TMD Major Defense Acquisition Programs.

Table 1-1. Reporting Requirement Change Summary		
Original Requirement*	**Current Requirement****	**Chapter Requirement Addressed In**
224(b)(1)	244(b)(1)	2, 3, & 4
224(b)(2)	244(b)(2)	2, 3, & 4
224(b)(3)	Original Requirement Deleted	N/A
224(b)(4)	Original Requirement Deleted	N/A
224(b)(5)	244(b)(3)	7
224(b)(6)	244(b)(4)	6
224(b)(7)	244(b)(5) + Language Deletions	8
224(b)(8)	244(b)(6)	5
224(b)(9)	244(b)(7) + Language Deletions	2, 3, 4, & 8
224(b)(10)	Original Requirement Deleted	N/A

* As Designated By Section 224 Of The National Defense Authorization Act For Fiscal Years 1990 And 1991

** As Redesignated By Section 244 Of The National Defense Authorization Act For Fiscal Year 1997

1.2 Ballistic Missile Defense (BMD) Program Priorities

Ballistic Missile Defense is an essential element of the U.S. National Military Strategy of flexible and selective engagement and for the achievement of that strategy's three components: peacetime engagement, deterrence and conflict prevention, and fighting and winning our Nation's wars.

Ballistic Missile Defense is an indispensable part of the peacetime engagement of our Armed Forces, providing opportunities for military-to-military contacts and security assistance programs which demonstrate commitment to our friends and allies, improving collective military capabilities, defending democratic ideals, and otherwise enhancing national security and regional stability.

Ballistic Missile Defense also contributes to the second component of U.S. National Military Strategy: deterrence and conflict prevention. The presence of BMD capabilities in regions where U.S. and allied interests are threatened, most significantly in Northeast Asia and the Middle East, will help deter potential aggressors from employing ballistic missiles by increasing the probability that such use would not be successful.

However, in the event that deterrence fails, the presence of defenses against states employing ballistic missiles armed with conventional, nuclear, biological, or chemical warheads helps ensure the third component of U.S. National Military Strategy--that U.S. Armed Forces be able to effectively fight and prevail in any armed conflict. In that event, ballistic missile defenses would directly protect United States. and allied armed forces and other valued assets from such an attack thus allowing the Commanders-in-Chief (CINCs) and warfighters to execute their mission more efficiently and effectively.

To ensure these capabilities, the Department focuses the BMD Program on three distinct priorities: (1) TMD, to address the short-range, widely dispersed theater ballistic threat which is here and now; (2) NMD, to position the United States to defend against a limited ballistic missile threat; and (3) Advanced Technology, which supports both TMD and NMD, to continue to advance our capabilities to counter future and possibly more complex threats.

Since early-1996, following the Defense Department's BMD Program Review, BMDO has been executing a TMD program plan which includes:

- Improving the capability of lower-tier systems, including both land- and sea-based defenses to protect critical assets and U.S. and friendly forces in inland and littoral (coastal) areas;

- Proceeding to add, albeit at a slower pace than previously envisioned, upper-tier (wide area) defenses and defenses against longer-range theater missiles, including Boost Phase Intercept (BPI) systems with the Air Force's Airborne Laser (ABL) Program as the primary BPI solution, as that threat emerges; and

- Continuing the development of upgraded Battle Management/Command, Control, Communications, Computers, and Intelligence (BM/C^4I) to improve early warning and dissemination, communications interoperability, and command and control centers for the "family" of TMD systems.

These added capabilities also provide improved lethality and probability of kill through the use of interceptors which employ advanced concepts such as directed energy hit-to-kill or improved guidance techniques combined with fragmentation warheads. Further, the tiered approach provides engagement opportunities throughout all phases of the Theater Ballistic Missile (TBM) flight: at both lower-altitudes and shorter-ranges (lower-tier intercepts within the atmosphere); at higher-altitudes and longer-ranges (upper-tier, exoatmospheric and high endoatmospheric intercepts); and during the boost phase (at various ranges) while the missile is over the aggressor's territory, for added effectiveness--a layered defensive capability. Finally, other advanced concepts for TMD will be demonstrated and/or explored.

The NMD program, the second priority of BMD, is structured as a "deployment readiness" program that is implemented by a "3+3" strategy. During the next three years the elements of an initial NMD system will be developed to allow an Integrated System Test (IST) in FY 1999. From that point, if a decision is made to do so, a NMD system capable of defending the 50 states against a limited threat could be deployed to achieve an Initial Operational Capability (IOC) within an additional three years. If the threat does not warrant a deployment decision after the FY 1999 test, additional development and testing will be accomplished, leading to a steadily increasing technical capability always positioned to allow fielding within a three year window. This strategy has the inherent advantage of positioning the United States to be able to defend against a relatively sudden and unexpected threat from a rogue nation without sacrificing the ability to defend against more sophisticated limited threats should that need arise.

The third BMD program priority is the Advanced Technology program to provide technology options for improvements to planned and deployed defenses. The program will invest in high leverage technologies that yield improved capabilities for TMD and NMD interceptors and sensors. Particular components that would be developed for each mission would be distinct and separate, but the technology is common to both missions. This investment will provide block upgrades to baseline systems that were developed, demonstrations to reduce risk and provide a more speedy path for technology insertion, and will prepare the United States for evolving, proliferating threats, which may include advanced countermeasures and submunitions. Further, the Advanced Technology program will explore and demonstrate alternate system approaches (i.e., Space Based Laser) that can provide major increases in TMD and NMD capability against the current and evolving threat.

1.3 Cooperation with Allies and Friends

As part of broader efforts to enhance the security of U.S. and allied forces against missile strikes and to complement counterproliferation strategy, the United States continues to explore opportunities for cooperation with its allies and friends in the area of TMD. The international community increasingly recognizes the existence and growth of the threat of missile attack and, as a consequence, commitments to TMD study and development efforts by U.S. allies have been increasing. Significant international participation in the BMD program will help achieve the U.S. goal of developing and deploying interoperable missile defense systems at reduced cost.

1.4 Anti-Ballistic Missile Treaty

The United States has continued to pursue agreements to clarify the 1972 Anti-Ballistic Missile (ABM) Treaty to preserve its viability in the context of the changed technological and political circumstances of the 1990’s. In October 1996, the ABM Treaty’s Standing Consultative Commission (SCC), with the participation of the United States, Russia, Belarus, Kazakhstan, and Ukraine, completed a draft of the so-called “Part 1” agreements. These relate to the multilateral succession to the ABM Treaty, demarcation of lower-velocity TMD systems, and confidence building measures concerning TMD systems. The “Part 1” demarcation agreement would make clear that TMD systems with interceptor missiles having velocities of 3 km/sec or less are compliant with the ABM Treaty, provided they are not tested against a ballistic missile target having a velocity or range greater than 5 km/sec or 3,500 km, respectively. Based on a ministerial-level agreement with Russia, the United States expected that the “Part 1” agreements would be signed by deputy foreign ministers at the end of October. Discussions also began in the SCC in October on a “Part 2” agreement on demarcation of higher-velocity TMD systems. However, late in October, the

Russians proposed changes to the documents that were inconsistent with that agreement between foreign ministers and unacceptable to the United States. Consequently, the documents were not signed.

Subsequent discussions at the political level and in a February-March session of the SCC failed to resolve outstanding issues. The deadlock, however, was broken by Presidents Clinton and Yeltsin at the March 20-21 Helsinki Summit. In a Joint Statement at the conclusion of their meetings, the Presidents announced agreement on the elements of a “Part 2” demarcation agreement. These elements are; (1) the velocity of TMD ballistic target missiles will not exceed 5/km/sec; (2) the range of TMD ballistic missiles will not exceed 3,500 km; (3) the sides will not develop, test, or deploy spaced-based TMD interceptors or components based on alternative technologies that could substitute for spaced-based TMD interceptors; and (4) the sides will exchange detailed information annually on TMD plans and programs. They also reaffirmed the importance of preserving the ABM Treaty and enhancing its viability, and declared that they had instructed their experts to “complete a demarcation agreement on higher-velocity TMD systems as soon as possible.” SCC #55 convened on May 14, 1997.

The Administration continues to believe it is desirable to conclude agreements on demarcation that would record a clear understanding on the compliance of TMD systems and preclude disputes or ambiguities concerning current and future TMD systems. In any event, however, the United States has made clear that U.S. TMD programs must and will go forward, and that each side will continue to make its own compliance determinations. To date, the Department of Defense (DoD) has determined that all of the core U.S. TMD programs, including Theater High Altitude Area Defense (THAAD) and Navy Theater Wide (NTW), are compliant as currently planned.

1.5 Conclusion

The U.S. Ballistic Missile Defense Program is a balanced program directed toward developing TMD, a critical component of a U.S. National Security Strategy that focuses on regional crises and proliferation; developing and testing an evolving NMD capability and maintaining a readiness to deploy such a capability when needed; and exploring advanced technologies essential for defenses against future threats. The remaining chapters in this report discuss program objectives in greater detail, describe the programs and projects being pursued to achieve these objectives, and summarize the current status and plans for each program.

Chapter 2

Theater Missile Defense

Chapter 2
Theater Missile Defense (TMD)

2.1 Mission and Scope

The mission of Theater Missile Defense (TMD), as defined in the TMD Mission Need Statement (MNS) is "to protect U.S. forces, U.S. allies, and other important countries, including areas of vital interest to the U.S., from theater missile attacks." The TMD mission includes protection of population centers, fixed civilian and military assets, and mobile military units.

The MNS also provides a basis for defining the scope of the program in terms of areas of TMD and the threats to be countered. It identifies four elements of TMD, frequently called “pillars”: Attack Operations (AO); Active Defense (AD); Passive Defense (PD); and Battle Management/ Command, Control, Communications, Computers, and Intelligence (BM/C^4I). The scope of the BMDO TMD program is to focus on AD and the associated BM/C^4I. The MNS defines theater missiles as “ballistic missiles, cruise missiles, and air-to-surface guided missiles whose target is within a theater or which is capable of attacking targets in a theater.”

The Department realizes that an imbalance in activity exists between Ballistic Missile Defense (BMD) and Cruise Missile Defense (CMD). Therefore, the Department has established a new management process to coordinate its requirements activities with the acquisition activities of the Services and the BMDO to develop an integrated Theater Air and Missile Defense (TAMD) strategy. A key to this management process is the establishment of the Joint Theater Air and Missile Defense Organization (JTAMDO). In order to integrate effectively and efficiently both the requirements definition and acquisition of TAMD, JTAMDO and BMDO will work together in developing a TAMD Master Plan for approval by the Joint Requirements Oversight Council (JROC) and Service and BMD Acquisition Executives.

2.1.1 Joint Theater Air and Missile Defense (JTAMD)

BMDO and JTAMDO have a shared responsibility to provide the Joint Force Commanders with an improved capability to defend against air and missile threats. The JTAMDO will define the required system interoperabilities and operational architectures and validate mission capabilities in coordination with the warfighting CINCs and Military Services. The JTAMDO effort integrates warfighter priorities into the Requirements Section of the TAMD Master Plan. BMDO assumes the role of Integration System Architect for theater air, cruise, and ballistic missile defenses. Jointly with JTAMDO and the Services, BMDO will work to translate the JTAMDO-developed operational architecture into a systems architecture, perform systems engineering at the architecture level, plan and ensure integrated testing of defense architectures, and lead program acquisition activities. BMDO will also work closely with Service and joint program offices to develop the Acquisition Section of the TAMD Master Plan.

BMDO expects its program plans to evolve over the next year as the results of on-going studies become available. While JTAMDO is responsible for developing centralized planning for TAMD in collaboration with the CINCs, Joint Staff and Services, the Defense and Component Acquisition Executives, requirements developers, program manager and resource allocation officials will execute the program in a decentralized manner.

JTAMDO and BMDO will work closely to fulfill their responsibilities by using an Integrated Product Team (IPT) approach to produce an effective Family of Systems (FoS) architecture, ensure its proper test and evaluation, and to integrate the FoS, which will provide an effective, wide-area missile defense against emerging threats. Toward this end, the Deputy Director, JTAMDO, and the Deputy for Theater Air and Missile Defense, BMDO, are cochairing an Integration IPT (IIPT) to oversee coordination of TAMD architecture and acquisition activities.

Through this process, which includes representatives from BMDO, JTAMDO, the Service Acquisition and Requirements communities, the CINCs, Joint Staff, the Office of the Secretary of Defense (OSD), the Intelligence community, and Defense Advanced Research Projects Agency (DARPA), BMDO and JTAMDO are developing a Master Plan building upon the existing TMD MNS, Joint Doctrine, existing Service programs, the TMD Active Defense Framework, and TMD Acquisition Strategy. The basic elements of these are discussed below.

2.2 Threat and Counterproliferation

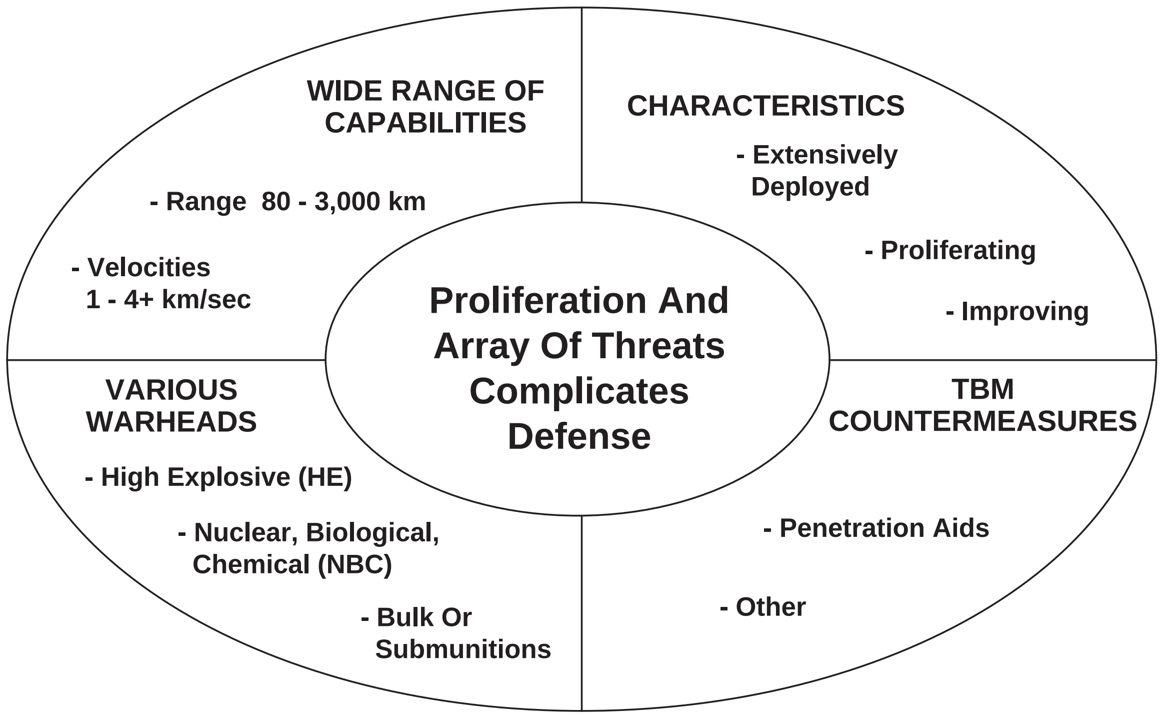
2.2.1 Threat

The continuing proliferation of ballistic and cruise missile systems is driving the development efforts of U.S. TMD planners. The proliferation of short-range ballistic missiles in the world today poses a direct, immediate threat to many of our allies and to some U.S. forces deployed abroad in defense of our national interests. The current threat includes tens of countries armed with missiles, hundreds of missile launchers, and thousands of missiles with ranges up to 3,000 kilometers. While the threat posed by these systems is largely regional, the trend is clearly in the direction of systems of increasing range, lethality, accuracy, and sophistication.

Because of their availability, theater missiles are proliferating throughout the world. A wide range of capabilities are available depending upon the investment a particular nation is willing to make and the technologies used. Adding to the complexity of the threat is the wide variety of warheads including high explosives, chemical agents, biological agents in unitary and submunition payloads, and nuclear weapons. The evolving threat may also employ countermeasures to reduce the effectiveness of TMD systems. Thus, the array of TBM threats and their proliferation significantly complicates the TMD mission. Figure 2-1 summarizes the current Theater Ballistic Missile (TBM) threat.

The proliferation of precision guidance, potential low observable technologies, and relatively inexpensive Land Attack Cruise Missiles (LACMs) has given adversaries an alternative for expanding their air deliverable threats. Such a threat could materialize via several paths, including: (a) indigenous development using components procured on the world market; (b) modification of existing unmanned air vehicles or antiship cruise missiles; or (c) the direct procurement of complete missile systems. Adding to BMDO concern is recognition that cruise missiles could be employed with low observable features and could be seen by our enemies as an attractive delivery mechanism for warheads of mass destruction. Although our intelligence has not yet identified an existing threat, BMDO is very concerned that a threat could emerge quickly with few early indications.

Figure 2-1. Summary Of The Theater Ballistic Missile Threat



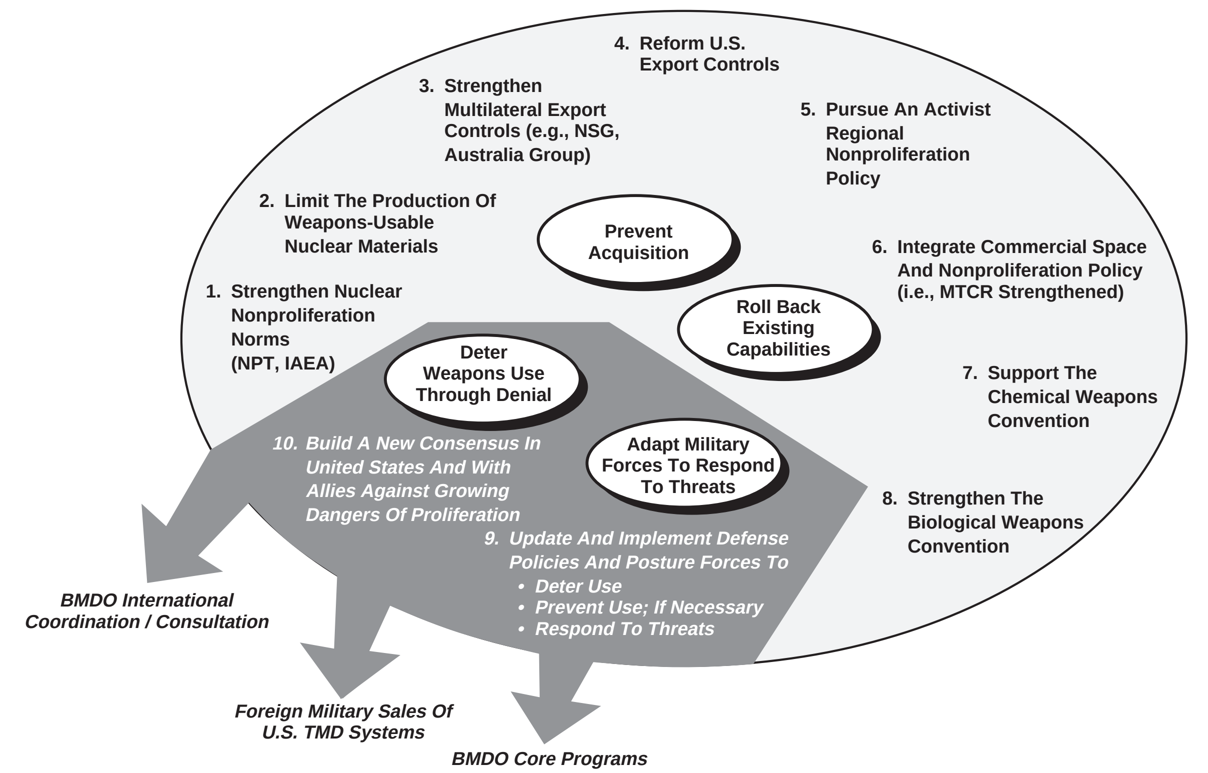
2.2.2 Counterproliferation

In a 1993 foreign policy speech to the United Nations, President Clinton stated that the proliferation of Weapons of Mass Destruction (WMD) and their delivery systems was a significant danger to U.S. national security and that controlling this proliferation was "one of the most urgent priorities." In response, Congress directed the Department of Defense (DoD) to lead an interagency study of Nonproliferation (NP) and Counterproliferation (CP) activities. As part of ongoing direction from Congress, DoD chairs an interagency Counterproliferation Review Committee (CPRC) and reports to Congress annually recommendations pertinent to modifications in programs required to address shortfalls in existing and programmed capabilities to counter the proliferation of WMD. This requirement has been extended by the FY 1997 Congressional Authorization Conference Report through FY 2000.

Figure 2-2 presents the principal elements of the U.S. strategy to stem proliferation. The highlighted areas are BMDO's contributions to this effort.

FY 1996 was a year of intense program review and budgetary scrutiny by both the Chairman of the Joint Chiefs of Staff (CJCS) and OSD. Specifically in FY 1996, the OASD(PA&E) conducted a Front End Assessment (FEA) of the CP Program Objectives Memorandum (POM). BMDO participated in the FEA providing scenarios, models, and simulation tools and assessments to demonstrate the relative benefit among active defense, attack operations, and passive defense capability. An important result from the FEA was that active defense is critical, especially early in a crisis. Attack Operations was also assessed as complementary to active defense, sharing cueing systems

Figure 2-2. Counterproliferation And The BMDO Contribution



and working to thin the threat later in a crisis to reduce the required active defense inventory and reactive stress loads.

Concurrent with the FEA, the FY 1996 CP Joint Warfare Capabilities Assessment (JWCA) surveyed all CINCs and returned an integrated and updated list of CP-related priorities and identified shortfalls (Figure 2-3) in capabilities to conduct warfare in a WMD threat environment. The Assistant to the Secretary of Defense for Nuclear, Chemical and Biological Programs (ATSD (NCB)), who manages the CP program for DoD, takes these CINC recommendations and establishes prioritized Areas for Capability Enhancement (ACE). Theater Ballistic Missile Active Defense was assessed #4 and #5 out of the "top 15" on the ACE lists. These two prioritized lists help focus ATSD(NCB) and the CPRC in supporting budgetary and programmatic priority.

BMDO was also successful in obtaining greater CPRC attention to U.S. programs of international cooperation. These international programs are to incorporate regional-specific strategies with associated effective interoperability solutions for combined warfare. These efforts, such as the NATO's Recognizable Air Picture, will serve as a valuable template for U.S. command and control requirements for TAMD.

BMDO will continue to maintain liaison with the ATSD(NCB) and other agencies with CP-related programs. As part of an ongoing investigation into the synergy between attack operations

Figure 2-3. Counterproliferation Priorities And Shortfalls

CINC Priorities	POM Improvements	Key Shortfalls
1. CP Intelligence Cycle		1. Not Assessed
2. Conventional Response With Minimal Collateral Effects	2. Improve Collateral Effects, Prediction, And Targeting Tools, Weapons Improvements	2. No Procurement Tails For ACTD Products
3. Special Operations Forces Response And Intelligence Collection / Analysis Targeting Covert / Paramilitary / Terrorist Threat	3. Improve Nuclear, Biological, And Chemical (NBC) Detection, Weapon Disablement, And Consequence Management	3. Unfunded Special Operations Command Capabilities, Chemical Threat Consequence Management Planning Exercise, Counterterrorism NBC Detection And Warning
4. Battlefield Nuclear, Biological, And Chemical Detection And Warning	4. Significant Modernization: New Chemical Dectectors, Detection On The Move, First Generation Biological Detectors	4. Biological Detection, Warning And Reporting; Insufficient Inventory Of All Items
5. TMD With Minimum Collateral Effects	5. 90% Intercept At Air Bases And Ports	5. Insufficient Inventory Of Interceptors
6. Defeat Underground Targets	6. Tunnel Defeat And Denial Technologies Explored	6. No Deep Tunnel Capability: No Procurement Tails For ACTD Products
7. Target Plan / Analysis Including Collateral Effects Prediction And Post Strike Assessment	7. Improved Planning Tools, Bomb Damage Assessment, Data Fusion And Munitions Effectiveness Assessment	7. No Procurement Tails For ACTD Products
8. Individual Protection	8. JSList Provides Improved Protection And Wearability	8. Insufficient Quantities; Protection Of Civilian Port Workers
9. Proliferation Pathway Analysis	9. Proliferation Path Analysis Tool	9. Shortfall Met
10. CMD / Aircraft Defense With Minimum Collateral Effects		10. Not Assessed
11. Collective Protection	11. Medical Facility Collective Protection	11. Sustained Operations On Air Base
12. Mobile Target Defeat	12. 20%-50% Defeat Capability	12. Not Assessed
13. Offensive Information Warfare		13. Not Assessed
14. CP Consequences Logistics Capability		14. Not Assessed
15. Decontamination	15. Tech Base Studies Of Nonaqueous And Large Area Decontamination	15. Sustained Operations On Air Base
16. NBC Medical Treatments		16. Not Assessed

and active defense, the ATSD(NCB/CP), the principal deputy for CP, has requested that the WMD-related target base studies currently underway in OSD, the Strike JWCA, and the Services be more closely integrated with BMDO's attack operations and active defense assessments.

2.3 Doctrine, Tactics, and Training

The future success of theater missile defenses will depend almost as much on doctrine, tactics, and training as on new weapon systems and force structure. To speak of TMD as a purely weapons driven program is to miss the magnitude of the problems facing the warfighter. TMD assets are developed, acquired, and tested by the Services with embedded interoperability, survivability, security, and sustainability for withstanding robust defense suppression threats in joint operational areas. Issues such as decentralized versus centralized control of TMD assets, the integration of TMD systems with an existing air defense force structure, and the ability to preposition or deploy TMD forces into the theater will be dominant themes in the coming years.

2.3.1 Joint Doctrine

The Department of Defense Joint Publication 3-01.5, *Doctrine for Joint Theater Missile Defense*, provides current TMD guidance on missions, command relationships, and responsibilities for combatant commanders and other joint force commanders, and prescribes doctrine for joint operations and training. The Joint Chiefs of Staff (JCS) is currently staffing Joint Publication 3-01, *Doctrine for Countering Air and Missile Threats*, as replacement doctrine guidance for Joint Publication 3-01.5. When completed, this publication will establish guidance for theater and joint force commanders to conceptualize, plan, and coordinate joint operations to counter aircraft, missile, and other threats within the air environment. It is further envisioned that JP 3-01 will be supported by two sets of Joint Tactics, Techniques, and Procedures yet to be developed: one for offensive operations and another for defense operations.

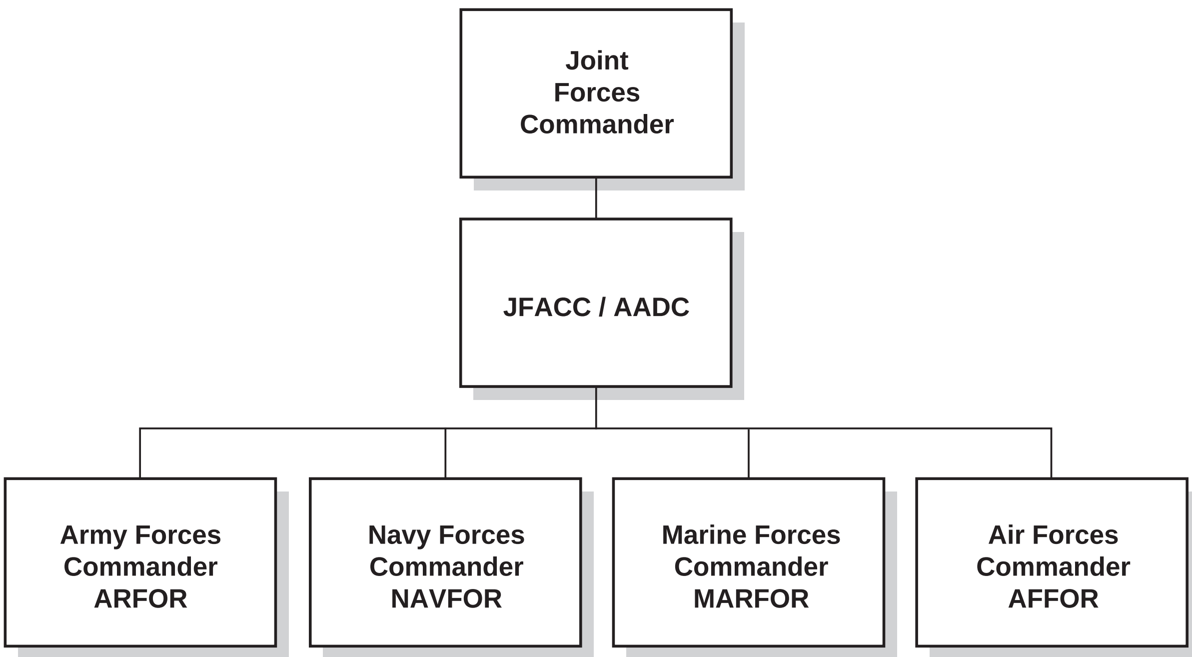
2.3.1.1 Joint Force Structure

Within the theater, the Army, Navy, Air Force, and Marines may be organized under their Service component commanders and report to the Joint Forces Commander (JFC). Alternatively, the forces may be organized under a Joint Forces Air Component Commander (JFACC), Joint Forces Land Component Commander (JFLCC), or Joint Forces Maritime Component Commander (JFMCC). In this case, for example, Marine forces may transition from the JFMCC to the JFLCC as they go ashore, and each Joint Force commander may have multiple Service units under its operational control.

Two principal players in the Joint Theater Missile Defense (JTMD) area are the JFACC and the Area Air Defense Commander (AADC). The JFC will normally assign overall responsibility for air defense to the AADC. Authority to integrate theater/Joint Operations Area-wide air defense forces and operations will be delegated to the JFACC/AADC. Air defense operations should be coordinated with other tactical operations, both on and over land and sea. Representation from all components involved should be provided, as appropriate, to the AADC headquarters. The JFC will normally assign responsibility for the planning and execution of JTMD attack operations or Offensive Counter-air Operations (OCA) outside the other component commander's areas of operations to the JFACC. Because of the need for the JFACC to maintain theater-wide visibility of JTMD attack operations and the integrated relationship between attack operations/OCA, active defense, and the other operational elements of JTMD, the JFC normally assigns the responsibilities of the AADC to the JFACC. Figure 2-4 shows a joint force structure.

The joint nature of TMD operations may be most evident in the missile detection and warning structure established to support the theater JFC and component commanders. BMDO is active in several systems, described below, that directly support the joint force structure.

Figure 2-4. Joint Force Structure



Logistics, force deployment, and asset prepositioning will continue to be major concerns to theater commanders. The United States has moved from a force structure that was forward based to one that is largely based in the continental United States (CONUS). These CONUS-based assets must be deployed to regional theaters, as needed, to support the operational commanders. The need to mobilize and transport large inventories of personnel and equipment will stress air, land, and sea lift capabilities. Prioritizing assets for transport in the crucial first days of an overseas campaign will present a critical challenge. During the Gulf War, U.S. TMD forces were already in place, trained, and integrated into the joint force structure when the first enemy missiles were launched. The United States and its allies may enter future campaigns under less favorable circumstances. In fact, an enemy may choose to expend the majority of its theater missiles well before U.S. and allied TMD assets can arrive on the scene. The major problems, then, are how much force structure should be prepositioned in anticipation of an actual deployment decision, and where and when should TMD forces be programmed into an already overburdened air and sea lift system.

The following paragraphs present the Army, Navy, Air Force and Marine Corps doctrine, tactics, training, and force structure overviews for TMD operations.

2.3.2 Army Doctrine

The role of Army TMD is to support the U.S. National Military Strategy of defense against theater missile attacks by protecting ground forces, conducting precision strikes, and dominating the maneuver battlefield. In fulfilling this role, virtually all operational scenarios envision the deployment of Army TMD forces as part of joint or combined forces. Army TMD provides theater CINCs with the ability to protect population centers, logistics assets, command and control centers, and other land based forces and critical assets, whether they are ground maneuver units, air bases, or naval port facilities, from the theater missile threat. The Army does this in two ways: first, by destroying enemy missiles (AD), and second, by conducting precision offensive counter strikes (AO). Army TMD helps CINCs protect, project, and sustain friendly forces by defending Air and Sea Ports Of Debarkation and Lines Of Communication against theater missile interdiction, and by protecting maneuver forces from being destroyed or contained in rear areas.

To establish and maintain an effective TMD capability against all theater missiles, the Army implements acquisition, intra-Service integration, and joint and combined interoperability warfare planning for Army TMD systems. The Army also identifies Army TMD requirements, and performs combat development, materiel development, and force development functions (doctrine, training, tactics, and force structure). This ensures resources are programmed to acquire weapon systems and to support unit activation, deployment, and sustainment after fielding.

Locating and destroying threat missile systems on the ground and in the air with AO and AD systems, preventing and minimizing the damage caused by theater missiles through PD, and integrating those capabilities with efficient C^4I systems contributes to land force dominance. This enables the theater CINC to achieve decisive victory with minimal casualties. The successful integration of the diverse forces and materiel into the four TMD operational pillars enables the Army to accomplish its TMD force protection role and allows friendly forces the freedom of ground maneuver.

Evolving Army TMD doctrine calls for a highly capable and robust ground-based defense that is rapidly deployable and sustainable in contingency theaters to support force projection operations. Army TMD doctrine will coincide with TMD joint doctrine and operational principles described in Joint Publication 3-01.5, *Doctrine for Joint Theater Missile Defense*. Army Field Manual, FM 100-5, *Operations*, the authoritative foundation for subordinate Army doctrine, recognizes that the threat to friendly forces has grown due to the proliferation of WMD and missile delivery system technology. In defining the requirement for force protection in each phase of an operation, FM 100-5 calls for a greater role for TMD as an enabler for the generation of combat power. An active TMD operational concept published by the U.S. Army Training and Doctrine Command (TRADOC) as a precursor to more weapon-specific doctrine, describes how a PATRIOT/Corps SAM/MEADS and THAAD task force will operate to provide a near-leak-proof, two-tiered defense of critical assets within a theater. PATRIOT/Corps SAM/MEADS will provide protection as the lower-tier system in the enclave or in its primary mission of protecting corps critical assets and maneuver forces through all phases of force projection operations from early entry through decisive operations.

Steps to increase proficiency in TMD will include incorporating the theater missile threat and TMD responses into all levels of training and service school programs of instruction, and capturing and understanding the lessons-learned from recent combat experience. TMD will be an integral part of live field training exercises at the combat training centers and the Battle Command Training Program, a training tool for corps and division commanders which uses constructive simulation and situational scenarios to execute large unit operations. As part of the Louisiana Maneuvers and the associated battle laboratories, TMD will be examined in detail to provide the best possible combat preparation for commanders, staffs, and soldiers.

2.3.3 Navy Doctrine

The Navy’s strategic statement of the naval role, “from the sea,” emphasizes the need for naval forces that can operate in any littoral (coastal area) theater to provide a forward presence and a timely, power projection capability. Naval forces can be configured to operate alone or in support of indigenous capability should it exist and, if necessary, to facilitate and support the insertion of follow-on joint or combined expeditionary forces. Accordingly, an important naval role in the post-Cold War era is to provide a prompt, survivable, and sustainable combat force that can effectively project power "from the sea" into theaters of operations.

The inherent mobility of naval forces and their capability for integrated warfighting make them an important foundation for CINC contingency planning and phased response to regional crises. Navy TMD systems are capable of creating an immediate defensive umbrella for expeditionary forces as they assemble and move into the theater of operations. If forced entry is required, the Navy's role will be to provide highly survivable active defense, complemented by attack operations against enemy missile sites and other key targets. Where time urgent command and control of theater air defense is required, the Navy may be assigned duties as the JFACC by the JFC. As joint or combined forces continue to insert capability into the theater and begin to move inland, the Navy's role will expand to include managing and defending the logistics pipeline, as well as extending the reach of attack operations. At that time, JFACC responsibilities may move from being a JFACC afloat to a JFACC ashore.

Naval forces are ideal for employment in the underdeveloped theater where U.S. ground and air forces are limited in extent or capability or for mitigating the liabilities and uncertainties of foreign bases. Naval TMD provides immediate, visible support for allies while acting as a nonintrusive catalyst for increased cooperation among future coalition members. Vital national interests could be protected from the sea due to optimum positioning flexibility for over water and coastal enemy TBM trajectories. By stationing firing units at sea, rules of engagement may also be more flexible than for batteries based ashore on foreign soil.

Command and control issues are being updated in operational doctrine and Concepts of Operations (CONOPS) at the training commands and the Naval Doctrine Center. The revised CONOPS will be incorporated in shore- and sea-based training. Within a theater-level architectural perspective, all functional areas, from intelligence and surveillance to post-engagement assessment, are being scrutinized for optimum effectiveness in joint and combined operations. Operational demonstrations and experiments are used to verify progress in system engineering and doctrine evolution. Operations of selected fleet units are addressing, as part of a CINC/BMDO-sponsored assessment program (see Section 2.12.1), key TMD issues in preparation for incorporating TMD into training and readiness exercises.

2.3.4 Air Force Doctrine

The Air Force considers theater air defense to be a layered defense employing joint operations. The CONOPS is to destroy the threat as far forward as possible. This requires coordinated and rapid offensive counter-air operations to destroy the threat and its infrastructure prior to launch, along with complementary and simultaneous defensive counter-air operations to engage and destroy targets in flight before they can threaten friendly forces. These offensive and defensive air operations, coupled with PD, minimize the impact of strikes against allied and U.S. bases and forces. The Air Force's adherence to "global reach/global power" was effectively demonstrated during Desert Shield by its ability to deploy rapidly and establish the defensive posture that, in turn, allowed the other Services to deploy, disembark, and establish their defenses. There is considerable debate over the command of, control of, and relationships among, theater missile defense, theater air defense, and counter-air operations. The Air Force considers theater air defense to be the integrated employment of joint forces to destroy or neutralize enemy offensive aircraft and theater missiles in order to protect friendly forces and vital interests.

The Air Force plays several vital roles in providing a TMD capability to the theater CINCs. The Air Force is meeting the TBM challenge by integrating a mix of mutually supportive PD, AD, AO, and BM/C^{4}I. The Air Force contributes to the campaign through tactical missile warning, cueing to ground-based forces, offensive and defensive counter-air, and air interdiction capabilities. When the Air Force is assigned duties as the JFACC, it plans and directs the use of assets to achieve air superiority.

Air superiority criteria include detecting, identifying, tracking, intercepting, and destroying enemy aircraft, cruise missiles, theater ballistic missiles, and launchers as well as their associated support infrastructure. Counter-air is the primary mission conducted to attain and maintain air superiority. Successful and timely countering of theater missile threats requires improved sensor target detection, tracking, and identification capabilities; a joint BM/C^{4}I architecture that includes decision aides; and streamlined execution of command and control functions. The connectivity between Services will allow for mission planning, integrated targeting, retargeting, multiple engagements, and flexible response options. Procedures and training are being developed to ensure the greatest efficiency of a multilayered TMD capability. Attacking mobile targets within minutes and seconds must become routine and requires full integration of all assets.

BMDO and the U.S. Air Force are pursuing the development and advancement of systems and technologies that can conduct the Boost Phase Intercept (BPI) mission. The leading technology is the Airborne Laser (ABL). A backup boost phase, kinetic energy missile is also being pursued by the DoD. Current activity is structured to provide an answer to issues relating to operations, force structure, and affordability of the ABL. The ABL may provide warfighting capability which currently is nonexistent, i.e., killing missiles in their boost phase to (1) preclude the use of advanced penetration aids and terminal defense saturation, (2) facilitate multiple engagement opportunities, and (3) put enemy territory at risk from rocket and warhead debris. The BPI capability, in conjunction with terminal defenses, will provide a truly layered defense against TBM threats.

2.3.5 Marine Corps Doctrine

The 1992 Marine Corps TMD Mission Need Statement outlined the Marine Corps' requirement for a TMD capability. As a result, the Marine Corps analyzed the current anti-air warfare doctrine to identify doctrinal changes and analyzed the Marine Air Command and Control System (MACCS) for required equipment improvements.

Marine Corps TMD doctrine is an outgrowth of existing Naval anti-air warfare system doctrine. This involves most of the existing command and control facilities and weapon systems, modified by the expanding threat and new operational concepts. In addition, Marines will capitalize on a long tradition of littoral operations to provide a seamless transition of joint expeditionary warfighting "from the sea" to maneuver ashore. Marine TMD operations will be characterized by flexibility, adaptability, and interoperability. Whether fulfilling the mission of the landward sector of the Naval TMD umbrella, bridging the transition of JFACC/AADC responsibilities from the Navy to the Army/Air Force inland, or contributing to the joint or combined structure during a sustained campaign, Marine doctrine and forces will be capable and compatible. Marine TMD forces are characterized by rapid deployability, sustainability, and instant readiness and are able to build quickly upon forward deployed units and maritime prepositioned forces to provide a CINC a tailored, integrated, and interoperable Marine Air Ground Task Force (MAGTF).

Marine Corps TMD operations fall under Marine Corps anti-air warfare system operations in joint, naval expeditionary, and amphibious operations. In joint operations, the Marine component commander or MAGTF commander is responsible to the JFC for Marine Corps TMD operations within the assigned area of operations. The MAGTF commander may delegate authority to the Aviation Combat Element commander for MAGTF TMD operations (exercised through the Marine Tactical Air Command Center). The Aviation Combat Element commander may further delegate authority to the MAGTF active TMD operations within the MAGTF's area of operations to Sector Anti-Air Warfare Coordinators (SAAWC)/Tactical Air Operations Center (TAOC). The Marine Aviation Combat Element and SAAWC/TAOCs coordinate TMD operations with the JFACC and AADC. The MACCS, specifically the radars of the TAOCs/(TPS-59), provide surveillance, early warning, and cueing for the MAGTF.

In naval expeditionary and amphibious operations, the MAGTF commander is designated as the Commander, Landing Force. Initially the Navy's Commander, Amphibious Task Force, is responsible for all TMD operations within the amphibious operative area. The Commander, Landing Force, becomes responsible for those sectors of the amphibious operative area assigned by the Commander, Amphibious Task Force, usually the landward sectors, when the means to command, control and defend the sectors are established ashore. Depending on the situation and mission, overall authority for TMD operations in the amphibious operative area can be passed ashore. When agreed to by the Commander, Amphibious Task Force, and Commander, Landing Force, and when the MACCS is capable, overall authority for TMD operations may be passed from the Navy to the Aviation Combat Element commander/AADC. After control is passed ashore, the Marine Aviation Combat Element ashore and SAAWC/TAOC coordinate TMD operations with the Navy, as required, and with other participating TMD command and control centers and weapon systems of the joint or combined forces.

The Marine Corps identified deficiencies in the MACCS and initiated upgrades to existing weapons systems, i.e., the HAWK missile system and the TPS-59 radar to provide a point defense capability for the MAGTF. In addition, the Marine Corps has expressed an interest in Corps Surface to Air Missile/Medium Extended Air Defense System (SAM/MEADS). A joint memorandum of agreement, signed by the Vice Chief of Staff for the Army and the Assistant Commandant of the Marine Corps, identifies the Marine Corps requirement for Corps SAM/MEADS.

2.4 Force Structure

The following sections describe the TMD force structure plans for the Army, Navy, Air Force, and Marine Corps.

2.4.1 Army

The Army's planned force structure consists of PATRIOT, THAAD, Corps SAM/MEADS, and Joint Tactical Ground Station (JTAGS). Currently, the PATRIOT force structure is comprised of 10 operational PATRIOT battalions containing 50 tactical fire units with an additional 4 fire units being fielded with the Alabama National Guard. Of the U.S. forces, six fire units are being used for Southwest Asia rotation and one battalion has been sent to South Korea to support U.S. forces. In addition to the U.S. force, 12 fire units are manned by German forces.

Two THAAD battalions, each with four firing batteries, are planned for fielding early in the next decade. The THAAD Program also plans to deliver a functional, developmental prototype system at the end of its Program Definition/Risk Reduction (PD/RR) phase. This system, referred to as the THAAD User Operational Evaluation System (UOES), will be used for Engineering and Manufacturing Development (EMD)-phase testing and will provide the means for early training. In the event of a national emergency, the UOES could become a deployable prototype system. This system will be based at Fort Bliss, Texas, and could be rapidly inserted into any theater using current military transport aircraft.

The Army plans to deploy six Corps SAM/MEADS battalions starting in 2005 pending an acquisition funding decision in FY 1998. It is envisioned that two Corps SAM battalions, each with three firing batteries, will support a corps size element. Along with the manpower savings, there will be a marked improvement in strategic and tactical deployability. It will have a C-130 roll-on/roll-off capability that allows Corps SAM/MEADS to deploy rapidly to theater utilizing less transportation assets.

Five JTAGS units, including two refurbished units, will be fielded starting in FY 1997 to provide in-theater processing of DSP satellite data for warning, alerting, and cueing of TBM launches. The JTAGS units will be deployed in pairs during wartime or contingency operations to ensure availability on a continuous basis. The current plan is to forward-deploy one section of each detachment during peacetime. The JTAGS is the in-theater element of the United States Space Command (USSPACECOM) Tactical Event System (TES).

2.4.2 Navy

The Navy Theater Ballistic Missile Defense (TBMD) Program is based on evolving the inherent air defense mission capabilities of AEGIS ships to contend with the unique intercept requirements posed by TBMs. The first stage of evolving this capability is called the Navy Area TBMD Program. During this stage the AEGIS combat system will be modified to support area TMD and the STANDARD Missile-2 will be modified to the Block IVA TBMD configuration. This area defense program will provide a lower-tier or endoatmospheric intercept capability. The second evolutionary stage of the Navy program will expand the battlespace by building on the combat system of the Navy Area TBMD system and developing an exoatmospheric (upper-tier) interceptor to provide a theater-wide TBMD capability to conduct ascent phase intercept against WMD. TBMD capability upgrades will be fully integrated with the AEGIS multi-mission capability in all four pillars of TMD.

The Navy's theater air defense architecture supports varying levels of theater-of-operations maturity. During the early stages of any conflict, a Navy carrier battle group may be the only U.S. or allied theater air defense capability in the theater. The carrier battle groups provide an initial capability to gain and maintain air control, possibly air superiority, and a complementing capability to defend coastal areas and counter strike against TBM attacks. AEGIS ships within the battle group command and control structure can operate autonomously with or without indications and warning from national sensors. Within the battle group, coordination would be performed via Link-16 with Link-11/voice backup for engagement status. Indication and warning messages would be provided on the Tactical Related Applications Program (TRAP) broadcasts and integrated into the system via Tactical Receive Equipment (TRE).

During amphibious operations, the role of the carrier battle group is to maintain air control and provide defense of forces moving ashore from the sea. AEGIS ships will perform the same functions described above for the underdeveloped theater with the additional responsibility of coordinating with USMC HAWK batteries for engagement status and cueing. As Army systems or other allied land forces are inserted into the theater of operations, the role of the carrier battle group will continue as before, and the AEGIS ships' role will be expanded to provide coordinated battlespace coverage with PATRIOT batteries, e.g., to provide engagement status and cueing. Finally, in a mature theater, the carrier battle group with its TMD-capable AEGIS ships, will be available to support TBM defense, counter forces, and cueing of other allied systems.

The near term Navy program will use TRAP/TRE and the Joint Tactical Information Distribution System (JTIDS) to the greatest extent possible. JTIDS, the Joint/NATO program which uses Tactical Digital Information Link (TADIL-J) or Link-16 messages, has been selected as the principal tactical communications system to support the TBMD mission. Joint or combined combat systems that may use the JTIDS network will receive all or portions of this information depending on their needs. Joint or combined systems that may use the JTIDS network include Airborne Warning and Control System (AWACS), Joint Surveillance Target Attack Radar System (JSTARS), Airborne Battlefield Command and Control Center (ABCCC), Control and Reporting Center (CRC), Air Defense Tactical Operations Center (ADTOC), PATRIOT, THAAD, E-2, CV/CVN, LHD, LHA, CGN 36/27, DDG 993, TAOC, and HAWK. A Link-11 TBMD capability will be maintained for backup and beyond-line-of-sight connectivity. The Link-11 TBMD data will be the same as the Link-16 data. New messages are being developed to implement this commonality.

The AEGIS Combat System will be equipped with TRE to provide data to the AEGIS Weapon System (AWS) from national assets (procurement and installation will be paid for by the Navy). TRE provides the capability to receive Tactical Data Information Exchange System B (TADIXS-B) and TRAP data.

The current command and control architecture provides a solid foundation for TBMD. The intrinsic Command and Control (C^2) capability of the AEGIS Combat System supports a rapid exchange of data over a variety of external C^2 networks. The possible future integration of the Navy's Joint Maritime Command Information System (JMCIS) will broaden this capability with increased connectivity to joint Service C^2 systems. Development and integration of overall TBMD battle planning functions into the Area TBMD program are under study, including their incorporation into tactical and operational documentation/doctrine. Computer program modifications to non-AEGIS Navy command and control participants in support of C^2 have been defined.

The Navy plans to achieve an Area theater ballistic missile defense contingency capability by 2000 with a UOES on at least one AEGIS ship. The user evaluation of the UOES in conjunction with testing at shore engineering support activities will provide significant opportunity for further development and validation of doctrine and tactics in both Navy and joint or combined warfare environments.

2.4.3 Air Force

Theater Air Defense is represented by four pillars--AO, AD, PD and BM/C^4I. The objective of the first pillar of attack operations is to destroy TBM launchers, missiles, support, and command and control infrastructure. In attack operations, destruction of TBMs and their infrastructure on the ground as early as possible in their life cycle is the first priority, referred to as prelaunch destruction. This involves preplanned attacks against the manufacturing and logistics infrastructure (the uncommitted phase) and preemptive attack against missiles in the forward area preparing for launch (the committed phase). The post-launch phase includes attacks by combat air patrol missions assigned against these time critical targets as well as attacks by redirected or retasked aircraft. Today, the Air Force possesses aircraft and weapons that can be employed to destroy a transporter erector launcher, classified as a soft target. The challenge is detecting and identifying these targets and then tasking the most appropriate resources to engage and destroy them within the shortest possible timeline. This drives the requirement to improve the connectivity for the current Theater Air Control System (TACS).

Active defense, the second pillar, protects assets and forces from attack by destroying airborne launch platforms and/or theater missiles in flight. Limited in Desert Storm to terminal intercepts by PATRIOT, the future architecture must be able to engage theater ballistic missiles throughout the entire missile flight profile. A multilayered defense provides multiple opportunities to negate theater missiles, increases the probability of kill, and prohibits the enemy from being able to counter the defensive system with a single technique or countermeasure. The Air Force's principal contribution to this multilayered architecture will be the development of a BPI capability. Attacking in the boost phase offers the greatest potential for eliminating problems associated with the type of warhead with submunitions that can be released before the missile can be engaged by non-boost phase defenses. Hitting missiles during their boost/ascent phase requires rapid response, since the missiles boost for only 60-150 seconds. By destroying a missile early in the boost phase, the system places the enemy in the potential position of having its own TBMs fall upon its territory. Thus, BPI provides enhanced deterrent capability to the BMD architecture.

The Air Force is acquiring the ABL to meet BPI requirements. The ACAT-ID acquisition program will integrate a high energy chemical laser, beam control utilizing adaptive optics compensation, and a battle management suite on to a 747-400 wide body aircraft. The development program will demonstrate the robust, high altitude standoff, theater missile defense capability achievable using the ABL. The Air Force is developing and has fully funded the Airborne Laser, which adds speed-of-light to the weapons solution and offers the most immediate promise to achieve the desired boost phase kills. Just as the time-sensitive nature of attack operations requires improvements in the TACS structure, so does BPI.

The third pillar, passive defense, strives to minimize the effect of theater missiles on U.S. and friendly forces and their operations. In addition, passive defense provides the capability to effectively recover and reconstitute forces following an attack. Effective passive defense employs several complementary techniques, among them hardening, dispersion, camouflage, cover, concealment, and timely warning of threat attacks.

All three of these pillars--AO, AD, and PD -- rest on effective BM/C^4I. A well-defined and effective BM/C^4I network will enable the JFACC/AADC to exercise C^2 over battlefield assets. Accurate intelligence will enhance the JFACC's ability to make the right decisions and quickly supply the shooters with the information they need to destroy the enemy.

The Air Force already has a system for conducting counter-air operations--the TACS. The Air Force TACS includes the organization, personnel, procedures, and equipment necessary to plan, direct, control, and coordinate theater air operations. The TACS elements include the Air Operations Center (AOC), Control and Reporting Center (CRC) with its Combat Integration Capability (CIC), AWACS, and JSTARS. The AOC, as the senior element of the TACS, can link national and theater sensors, intelligence, and communications with other Service or component operations centers to plan, coordinate, and integrate all the operational elements of TAD into offensive and defensive counter-air operations. TACS has already worked well for such missions as offensive and defensive counter-air operations, and the Air Force believes the same system will continue to work for theater missile threats.

The Air Force is responsible for space-based TBM launch detection and warning. Currently, space-based ballistic missile launch detection is accomplished by DSP satellites. Fixed and mobile DSP data processing centers transmit strategic launch detection and missile parameter information to the Combat Operations Center at Cheyenne Mountain, Colorado. This information is then evaluated and forwarded to end users such as the National Military Command Center and U.S. forces worldwide. The Attack and Launch Early Reporting to Theater (ALERT) system processes data from multiple DSP satellites at a processing center at Falcon Air Force Base and transmits warning of tactical missile launches over the Tactical Information Broadcast Service (TIBS) and TRAP Data Disemination System (TDDS) networks. This processing is done in near real-time to meet in-theater tactical response timeline requirements. DSP data can also be processed directly in the theater for tactical applications and for processing by other systems.

DoD designated the Air Force its executive agent for theater air defense BM/C^4I. As the executive agent, the Air Force is responsible for constructing a theater air defense BM/C^4I architecture that will provide the CINCs a flexible system to integrate joint forces and all operational elements required to counter-air and missile threats. Requirements for TMD BM/C^4I are being coordinated with AF/XOR, the office designated by the Secretary of the Air Force as the Executive Agent for Theater Air Defense.

2.4.4 Marine Corps

The Marine Corps force structure is evolving a TMD capability through the modification and upgrade of existing weapon systems. Initial operating capability will provide TMD detection and engagement in FY 1998. A full operational capability with improved C^2 will be fielded in FY 1999-2000. Marine TMD force structure consists of the following elements:

- Tactical Air Command Center (TACC). A command and planning level facility which receives, processes, and transmits TBM/aircraft targeting information to other elements via digital data communications. There are four TACCs in the operating forces.

- Tactical Air Operations Center (TAOC). A control and coordination facility which provides TBM target data to the weapon elements via digital data. There are six TAOCs in the operating forces.

- TPS-59 Radar. Provides surveillance, early warning and weapons cueing for the MAGTF. The upgraded version will detect, track, and process TBM targets for the TAOC including launch point estimates and impact point predictions. It will retain its air breathing target detection capabilities. There are 11 TPS-59 radars in the Marine Corps with 6 in the operating forces.

- Air Defense Communications Platform (ADCP). Provides a communications interface from the TPS-59 radar at the TAOC for the JTIDS/TADIL-J data network. There will be 12 ADCPs in the operating forces at the HAWK missile system fire units.

- HAWK missile system. Acquires, tracks, and engages short-range TBM targets. There are 6 batteries of HAWK in the operating forces currently configured to yield 12 firing units.

Based on Defense Planning Guidance and Commission on Roles and Missions language, the Marine Corps expects to transfer its Medium Air Defense mission to the U.S. Army at a date based on expected fielding of Corps SAM/MEADS.

2.4.5 Joint Theater Missile Defense

This section describes the joint force structure and identifies the joint early warning and dissemination systems.

2.4.5.1 Joint Theater Early Warning and Dissemination

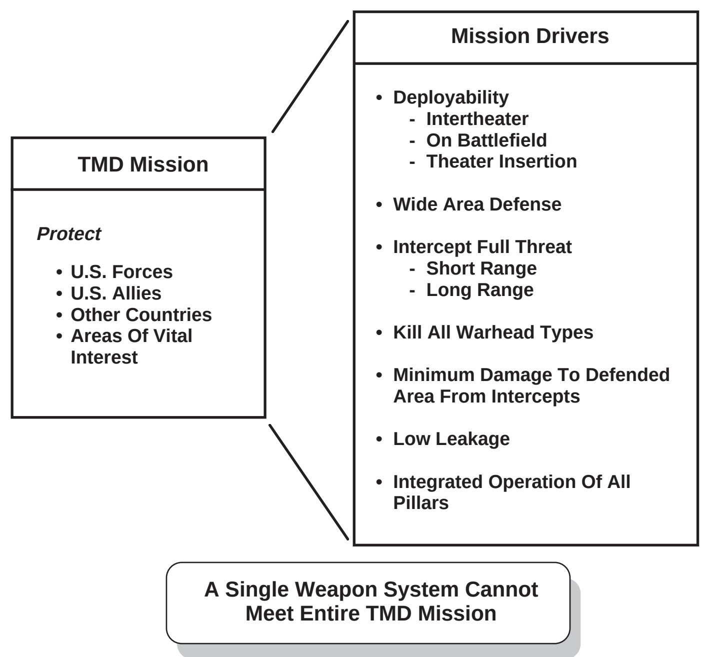
After the Gulf War, the Services recognized the need to improve missile threat warning to their deployed forces. This need resulted in the creation of three complementary systems to process tactical warning data quickly and more accurately and disseminate that information to the theater. Each of the new systems combines inputs from two or more DSP satellites ("stereo" DSP data) with other sources (e.g., national sensors, radar, intelligence) to refine launch point and missile trajectory predictive ability.

The Air Force has developed a prototype for U.S.-based stereo DSP processing called SHIELD. The fielded capability of SHIELD, designated ALERT, provides theater commanders with continuous, accurate launch warning and tracking data. A Navy demonstration of a related technology, begun as Radiant Ivory, will become operational as Tactical Detection and Reporting (TACDAR). Finally, JTAGS is a joint Army-Navy program for in-theater DSP data processing and distribution. It will be formally fielded in FY 1997.

2.5 TMD Active Defense Framework

The 1993 Theater Missile Defense Initiative Report to Congress presented a framework and architecture developed from operational and technical attributes. BMDO continuously evaluates the TMD mission, threat characteristics, and doctrine and updates the mission drivers and desired TMD performance characteristics. The TMD Cost and Operational Effectiveness Analysis (COEA) completed in FY 1996 is an example of a recent evaluation. The TMD COEA reaffirmed that "a single weapon system cannot meet the entire TMD mission." This continuous process ensures that the framework and architecture meet the TMD system requirements. Figure 2-5 shows the TMD mission and resultant mission drivers.

Figure 2-5. TMD Active Defense Mission Drivers



The mission drivers are used to identify the key performance characteristics of the TMD system. Figure 2-6 shows the resultant performance characteristics.

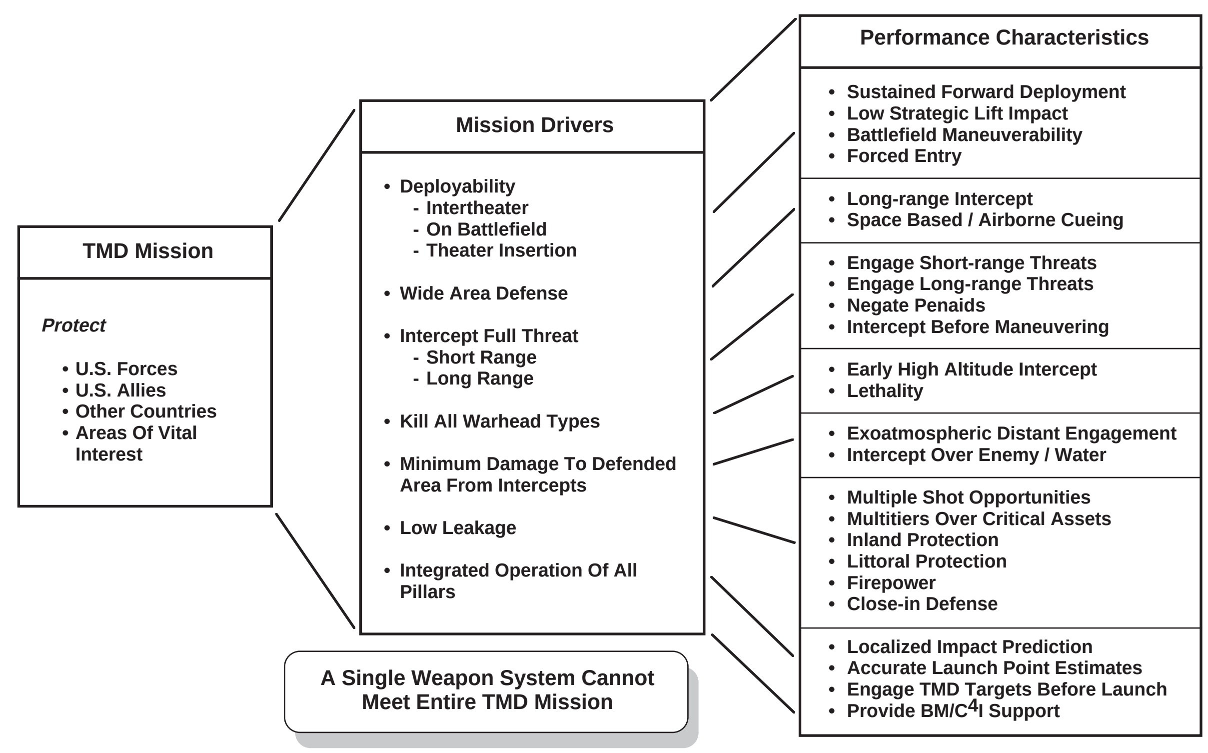
An examination of these performance characteristics leads to the conclusion that boost phase, upper, and lower-tier TMD systems consisting of land, sea, and air forces provide the most effective framework for TMD. This framework is shown in Figure 2-7.

As indicated, BM/C^{4}I remains the critical element that ties the other elements together.

2.6 Acquisition Strategy

The TMD program continues to be DoD’s top priority in providing U.S. forces a highly effective AD capability. As such, the acquisition strategy for the TMD program is geared toward the robust

Figure 2-6. TMD Performance Characteristics



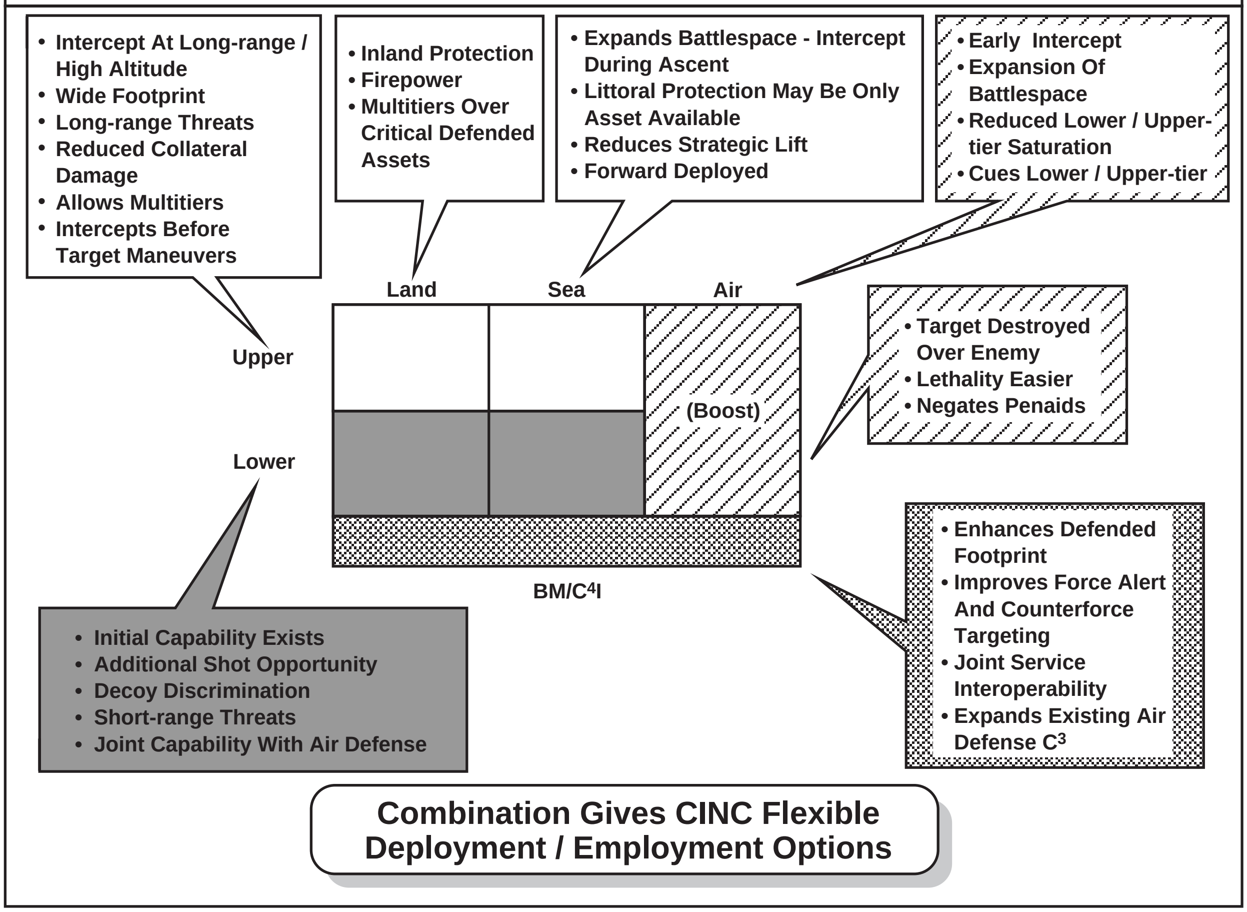
and early deployment of improved missile defenses, and to respond quickly to the theater-level threat. The DoD's strategy includes maximizing prior investment in ongoing Service programs and the existing infrastructure, and minimizing risks associated with both developing and introducing the new capabilities into the existing force structure.

In early 1996, the DoD completed a BMD Program Review which reaffirmed the TMD program priority status. In this review, DoD refined the underlying TMD acquisition strategy to address increased program risk areas, enhance overall TMD program balance and affordability, and synchronize the program schedule with the existing and emerging missile threats. The current strategy also accounts for all FY 1997 funding requested by the President, as well as the funds that were added by Congress.

Similar to last year's plan, the first thrust of the TMD program is to complete the near term improvements to the missile defense systems that are currently fielded. These include the Army's PATRIOT Advanced Capability-2 (PAC-2), the Marine Corps' HAWK missile system, and other joint sensor cueing and communications systems. These improvements are nearing completion, resulting in substantial performance gains over which U.S. forces were able to provide during the Desert Storm campaign. The balance of the TMD acquisition strategy focuses on the remaining TMD priority areas, namely:

- Acquisition Programs
  - Lower-tier (or area defense) systems;
  - Upper-tier (or theater-wide defense) systems;

Figure 2-7. TMD Active Defense Framework



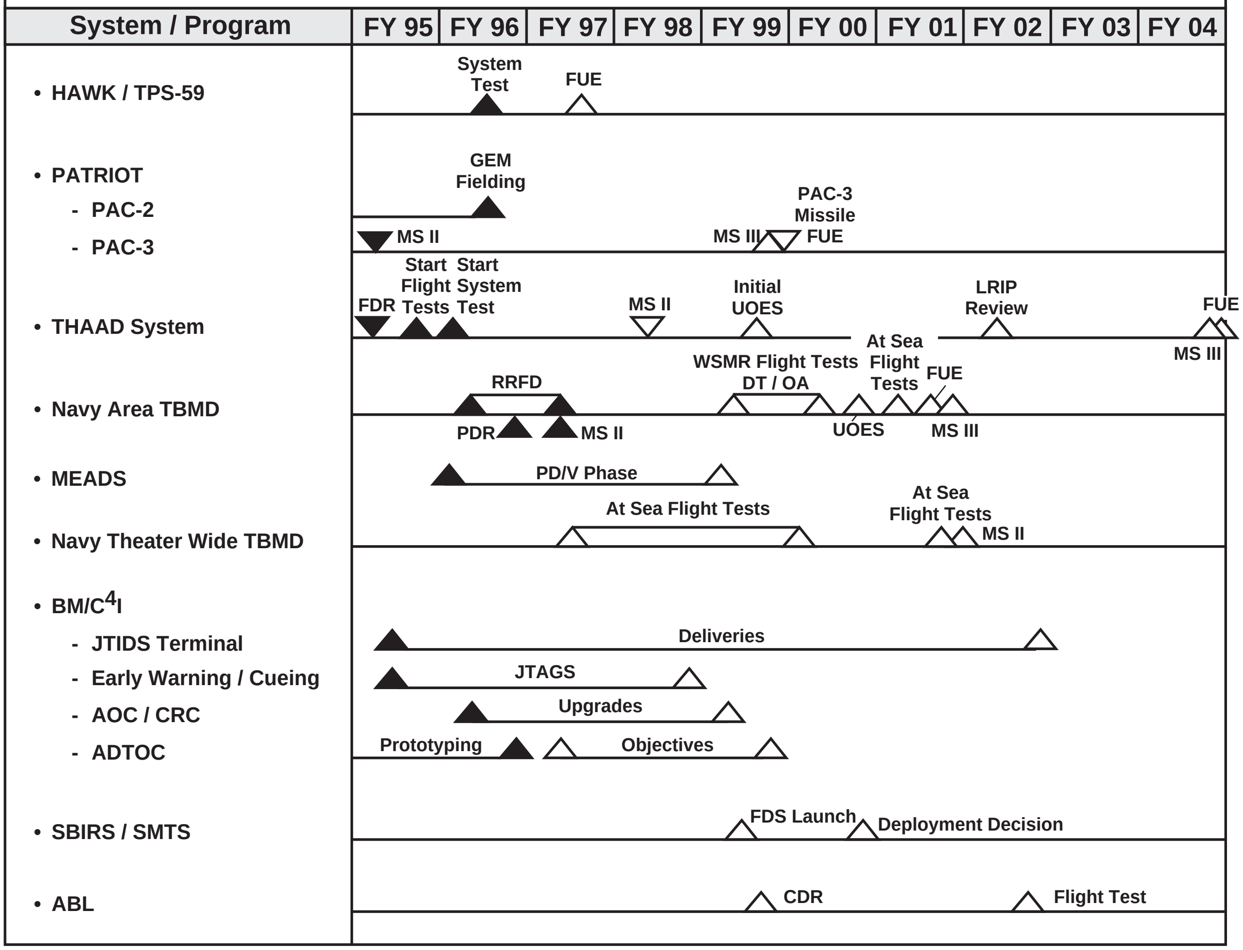
- BM/C^{4}I Improvements and Upgrades;
- Other Concepts;
- Joint TMD Support Programs.

The current strategy also includes the operational employment of systems developed during the PD/RR and EMD phases of the acquisition process. These UOES serve four purposes: (1) influence the engineering and manufacturing development program by getting users involved early; (2) provide systems for testing, evaluating, and training as part of the normal acquisition process; (3) refine operational doctrine and organization structures; and (4) provide a contingency defense capability should the need arise in an emergency prior to production and deployment. The acquisition program for THAAD and the Navy Area TBMD program include provisions for UOESs. The Air Force ABL PD/RR aircraft will provide some Residual Operations Capability prior to the EMD and production phases.

2.7 Master Schedule

Figure 2-8 shows the master schedule for the TMD core programs. The schedules have been adjusted to reflect the current year budget (FY 1997) and the FY 1998 President's Budget.

Figure 2-8. TMD Master Schedule



2.8 Near Term Improvements

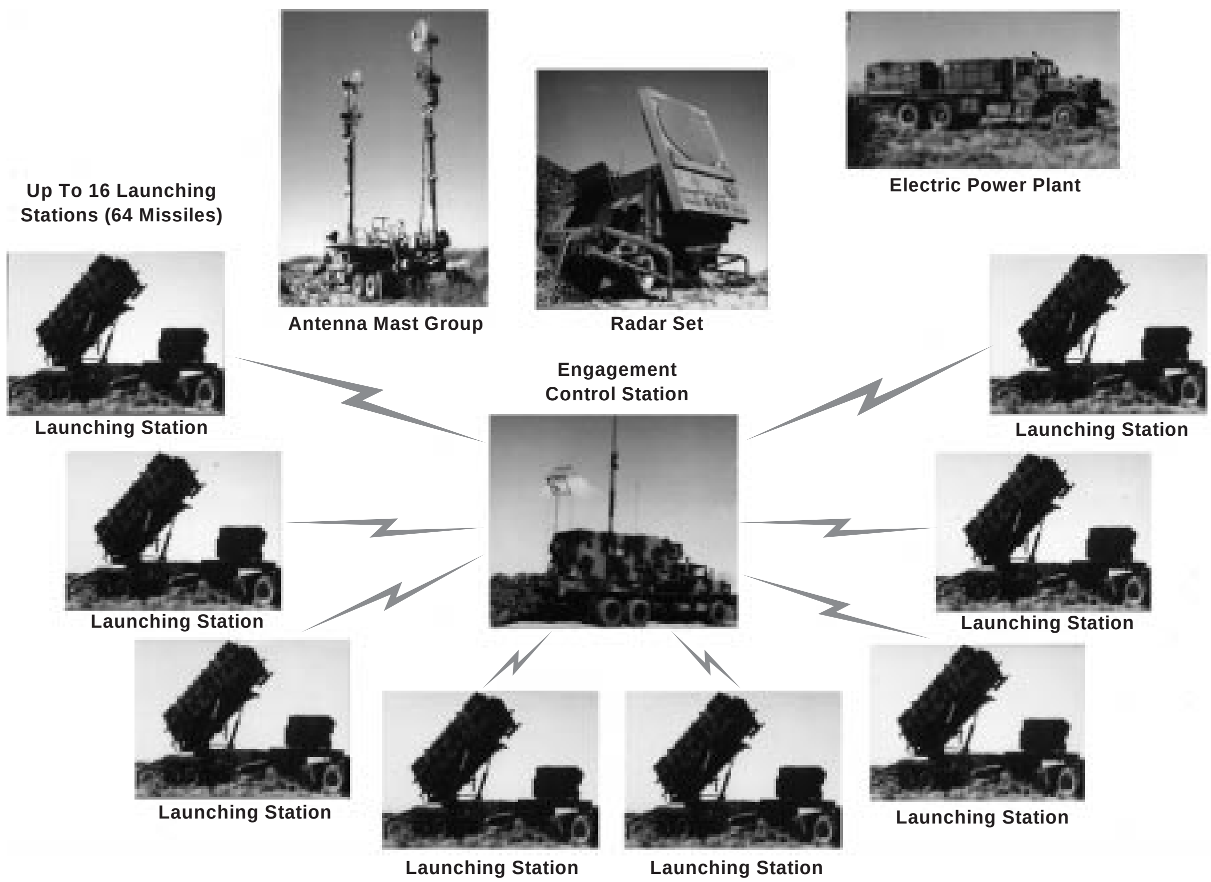
Near term improvements increase existing theater missile defense capabilities until the core programs are available at the end of the decade. These improvements are PATRIOT Advanced Capability-3 (PAC-3) upgrades, TPS-59 radar and HAWK modifications, and BM/C^{4}I improvements including sensor cueing upgrades.

2.8.1 PATRIOT Advanced Capability-3 (PAC-3)

Recent upgrades to the PAC-2 system consist of the Quick Reaction Program (QRP) and a Guidance Enhancement Missile (GEM). Current upgrades under the PAC-3 Program are packaged into three configurations. Configuration 1 will complete fielding in FY 1997 while Configuration 2 fielding is ongoing. Configuration 3 First Unit Equipped (FUE) is scheduled for FY 1999, and will include the deployment of PAC-3 missiles to augment the existing inventory of PAC-2 and GEM missiles.

PATRIOT is an air defense guided missile system designed to cope with the air defense threat of the 1990s, characterized by defense suppression tactics using saturation, maneuver, and electronic countermeasures. The principal element of the PATRIOT organization is the battalion, which consists of up to six firing batteries. Battalions normally deploy at echelons above the corps and as part of the corps air defense artillery brigade. The PATRIOT battery, also referred to as a fire unit, is the smallest element capable of engagement operations. The PATRIOT firing battery, shown in Figure 2-9, includes the fire control section and normally eight Launching Stations (LS), although a battery has the capability to control up to 16 launching stations. The fire control section consists of a Radar Set (RS), Engagement Control Station (ECS), Antenna Mast Group (AMG), and Electric Power Plant (EPP).

Figure 2-9. PATRIOT Firing Battery



The need for an anti-tactical missile capability was identified in the 1980s from the deployment of large numbers of accurate Soviet tactical ballistic missiles in eastern Europe. The PATRIOT Advanced Capability-1 (PAC-1) and PAC-2 programs were developed to provide the PATRIOT system with additional capabilities to defend itself and critical assets against TBM threats and continue to carry out its primary mission.

The PATRIOT QRP was instituted in 1991-1992. This program, designed to identify and field improvements quickly to correct Desert Storm shortcomings, includes emplacement upgrades for rapid, accurate fire unit emplacement, a capability to deploy remote launchers up to 10 km from the radar, and radar enhancements to improve TBM detection and increase system survivability.

The QRP configuration of PATRIOT is already operational and deployed in Saudi Arabia. All U.S. PATRIOT fire units have been converted to the QRP configuration.

GEM is a companion program to the QRP. GEM includes engineering improvements to the PAC-2 missile to increase effectiveness and lethality, especially against the Desert Storm-class of TBM threats, by modifying the receiver and fuzing. GEM fielding began in FY 1995 and a total quantity of 345 (180 new and 165 retrofitted) missiles will be procured by the end of FY 1997.

FY 1996 efforts resulted in the following accomplishments:

- Continued delivery of GEM missiles;
- Completed fielding of QRP-configured National Guard Battalion;
- Completed fielding of the QRP battalions;
- Continued fielding of PAC-3/Configuration 1 upgrades (including GEM deployment);
- Completed FUE for PAC-3/Configuration 2 upgrades.

Work planned for FY 1997:

- Complete delivery of GEM missiles;
- Continue fielding of Configuration 2 upgrades;
- Initiate Flight Test Program for the PAC-3 missile and PAC-3 Configuration 3 system.

2.8.2 Marine Corps Theater Missile Defense Initiative (TMDI)

TPS-59 radar and HAWK weapon system improvements, summarized in Figure 2-10, will provide a TMD capability for U.S. Marine Corps operations. The Marine Corps TMD Initiative is jointly funded with BMDO and will yield a low-risk, near-term capability for expeditionary forces against short-range ballistic missiles. The program consists of modifying the TPS-59 long-range air surveillance radar and the HAWK weapon system to allow detection, tracking, and engagement of short-range TBMs. The program will also provide a communications interface by developing an ADCP.

The TPS-59 radar serves as the primary sensor for the Marine TAOC, which is responsible for conducting all Marine Corps anti-air warfare functions including the control of friendly aircraft and missiles. The TPS-59 radar's mission includes detection of up to 500 targets consisting of a mix of aircraft, both fixed and rotary wing, cruise missiles, and tactical ballistic missiles. The modifications to the TPS-59 radar increase the radar's ability to detect small radar cross section targets and adds a tactical ballistic missile detection and tracking capability. As a result of these modifications, the TPS-59 radar will provide surveillance at ranges out to 400 nautical miles (750 kilometers) and at altitudes up to 500,000 feet (150 kilometers).

The HAWK weapon system modifications include upgrades to the battery command post and improvements to the HAWK missile that increase the missile's lethality against tactical ballistic

Figure 2-10. TPS-59 Radar And HAWK

BMDO Funded

- **Upgrade TPS-59 To Provide Enhanced TBM Surveillance And Tracking Capability**
- **Air Defense Communications Platform To Act As A Node For Tactical Nets**
  - **Make TPS-59 Data Available On A JTIDS Net**
- **Modify Battery Command Post To Accept TPS-59 Data, For Acquisition By HAWK Illuminator Radar**
- **Upgrade HAWK Missile Fuze And Warhead For TBM Engagements**

USMC Funded

- **Upgrade Of HAWK Launcher To Interface With Digital Missiles**
- **Upgrade Of HAWK Launcher To Increase Mobility**
- **TPS-59 Modification Kit Procurement**

missiles. The modified HAWK battery command post will process cueing data from remote sensor systems and control the HAWK High Power Illuminator Radar. The improved lethality missile will incorporate fuze and warhead modifications. Three hundred improved lethality missiles have been transferred from the Army to the Marine Corps. Another 700 missile modification kits will be procured by the end of FY 1997. Production of the battery command post modification kits began during FY 1995. The installation of all battery command post modifications kits was completed during FY 1996.

The ADCP will convert TPS-59 data messages and TADIL-J formatted messages into the intra-battery data link formats required by the HAWK weapon system. The ADCP will also transmit TADIL-J formatted messages to other theater sensors. This communications interface is currently in development and initial production will begin in FY 1997.

During FY 1996, the TPS-59 and ADCP completed operational testing and evaluation at White Sands Missile Range, New Mexico. A successful TMD demonstration was conducted as part of that test. This demonstration, consisting of live fire intercepts of Lance missiles on 50 to 130 kilometer trajectories, was highlighted by the multiple simultaneous engagement of a Lance missile and two air breathing threats. A Milestone III decision for the TPS-59 was made in December 1996. The Milestone III decision for ADCP is scheduled for FY 1997. No BMDO-funded activities are planned for FY 1998 and beyond.

FY 1996 efforts resulted in the following accomplishments:

- Completed TPS-59 operational testing for Milestone III (Production Decision);
- Completed TMD demonstration;
- Completed Battery Command Post Modifications;
- Initiated Improved Lethality Missile modification procurement;
- Completed HAWK additional fuze modification procurement;
- Initiated ADCP long lead item procurement.

Work planned for FY 1997:

- Complete the evaluation of operational testing results;
- Complete Milestone III (Production Decision) for ADCP;
- Initiate TPS-59 modification kit procurement;
- Initiate ADCP procurement;
- Complete Improved Lethality Missile modification procurement;
- Demonstrate TADIL-J connectivity with other Services/systems.

2.8.3 BM/C^{4}I Improvements

Battle Management/Command, Control, Communications, Computers, and Intelligence (BM/C^{4}I) is the critical component that ties the family of systems together. While each system of the family can effectively fulfill its unique mission as a stand-alone element, BM/C^{4}I allows the synergy of systems to significantly improve effectiveness, increase defended area footprint, and reduce leakage of hostile missiles through the theater missile defense. Two areas of near term BM/C^{4}I improvements are early warning and dissemination and sensor cueing capabilities. These activities directly support the ongoing developmental efforts described in the BM/C^{4}I in Section 2.10.

2.8.3.1 Early Warning

Early warning improvements address shortcomings from Desert Storm. These improvements provide earlier targeting opportunities for active defense elements and earlier warning for passive defense. Counterforce strikes may also benefit from better launch point estimates. The complementary programs that provide these improvements are the Air Force's ALERT Program, the Navy's TACDAR Program, and the Army-Navy JTAGS Program. The complementary capabilities of these programs are integrated within the USSPACECOM Tactical Event System (TES). TES will meet the TMD requirements for launch detection and warning as tactical processors mature from demonstrations to full operational capability.

These early warning programs will interface with the TDDS, TIBS, and other tactical data networks to provide a robust capability for all Service users. SHIELD (formerly Talon SHIELD) is a BMDO-sponsored design, development, demonstration, and test platform for multisensor data fusion and communications processor. SHIELD, collocated with its operational version, ALERT, at Falcon Air Force Base, Colorado, currently processes and fuses multisensor DSP and classified sensor data. The operational ALERT system provides theater commanders with continuous, accurate launch warning and tracking data. SHIELD is also the design, development, demonstration, and test platform for JTAGS. ALERT is the first system sponsored by BMDO to achieve operational status. TACDAR processes classified data from a unique sensor. It also provides the data to ALERT for fusion with data from other sensor assets. The JTAGS Program is a tactical mobile stereo DSP ground station for use in the theater. JTAGS processes sensor data from up to three DSP sources. The JTAGS Program utilizes ruggedized hardware and software developed by the BMDO-sponsored Tactical Surveillance Demonstration (TSD) and the Army- and Navy- sponsored Tactical Surveillance Demonstration Enhancement (TSDE) Programs.

Processor improvements and developmental and operational testing were conducted in FY 1995 and continued in FY 1996. Significant SHIELD tests included demonstration of multiple satellite data fusion against cooperative launches and targets of opportunity. ALERT achieved initial operational capability on March 10, 1995. The Army conducted JTAGS EMD phase technical and operational tests during FY 1995. The Air Force conducted technical testing for the Space Based Infrared System (SBIRS)-Low Altitude component flight demonstration system and continued development during FY 1996. All of these activities will be continued in FY 1997.

FY 1996 efforts resulted in the following accomplishments:

- Using SHIELD, completed integration of a classified suite of surveillance sensors and transferred capability to ALERT and JTAGS;
- Tri-Service (Army/Navy/Air Force) agreement on SBIRS development of a joint service common multi-mission mobile processor;
- Demonstrated improved launch detection and early warning performance with targets of opportunity worldwide;
- Using SHIELD, demonstrated improved data fusion from multiple satellite sensors worldwide and transferred capability to ALERT and JTAGS;
- Performed risk reduction efforts for SBIRS using SHIELD;
- Completed JTAGS developmental and operational testing;
- Began JTAGS production;
- Continued the rehost of the Composite Tactical Display/Generic Area Limitation Environment to a Silicon Graphics Incorporated (SGI) platform using SHIELD.

Work planned for FY 1997:

- Continue SHIELD/ALERT test and evaluation activities;
- Initiate JTAGS Pre-Planned Product Improvement (P^3I) Fusion effort to implement data fusion with TACDAR and other potential sensor sources to improve attack operations as well as active and passive defense;

- Initiate JTAGS P^3I Beacon effort to further reduce DSP line-of-sight errors and improve support for attack operations;
- Complete SBIRS/JTAGS study on joint common multi-mission mobile processor;
- Develop and demonstrate fusion and processing of other intelligence data using SHIELD and transfer capability to ALERT;
- Perform risk reduction efforts for the SBIRS using SHIELD;
- Field JTAGS units;
- Complete the rehost of the Composite Tactical Display/Generic Area Limitation Environment to an SGI platform using SHIELD;
- Conduct experiments on TACDAR auto-release messages to ALERT;
- Investigate and implement TACDAR and ALERT message consolidation.

Work planned for FY 1998:

- Complete SHIELD/ALERT test and evaluation activities;
- Continue risk reduction efforts for the SBIRS SHIELD.
- Implement TACDAR auto-release messages to ALERT first increment;
- Complete implementation of TACDAR and ALERT message consolidation;
- ALERT Full Operational Capability (FOC) on October 1, 1997.

2.8.3.2 Sensor Cueing

Sensor cueing enhances the detection of targets by fire control radar systems. This enhancement results in reduced radar loading and extended target acquisition range. Radar loading is reduced during TBM detection and tracking by decreasing the radar's search volume. Extending the target acquisition range permits the radar to increase its defended area footprints. This increase in range is particularly important in non-benign environments, i.e., multi-target, electronic countermeasures, and inclement weather. Additionally, resulting enhanced beam scheduling improves target acquisition in non-benign environments while reducing the system's vulnerability to saturation raids and to anti-radiation missiles.

Sensor cueing efforts include development of software to accept cues into current systems and tactical cueing and netting demonstrations. TMD weapon systems, such as PATRIOT or THAAD, are cued by other tactical systems and sensors such as JTAGS/ALERT, TPS-75, SPY-1, or TPS-59. Other sensor efforts include tactical processing and application of space sensor data in the ALERT project and airborne sensor technology development. Sensor cueing efforts provided operational PATRIOT cueing software during FY 1996. In FY 1997, the cueing demonstrations will transition to the CINCs' TMD Assessment Program.

2.9 Acquisition Programs

The TMD acquisition programs include the core programs, Corps SAM/MEADS, and the Air Force's ABL. The following sections discuss the status of the TMD acquisition programs.

2.9.1 Introduction to TMD Core Programs

In FY 1996 there were three core programs: the PATRIOT Advanced Capability-3 (PAC-3), the Navy Area Theater Ballistic Missile Defense, and the Theater High Altitude Area Defense (THAAD) System. The first two are improvements to existing air defense systems which will significantly enhance lower-tier ballistic missile defense. The third program includes a new missile, a new radar, and associated BM/C^4I to provide an upper-tier capability. Beginning in FY 1997, BMDO moved Navy Theater Wide TBMD into the core programs. The four core programs will significantly enhance the U.S. TMD capability.

The PAC-3 System will incorporate a new, highly lethal hit-to-kill interceptor and improvements to the PATRIOT ground radar, launcher, and communication systems.

The Navy Area TBMD Program adds TBM capability to the STANDARD Missile while maintaining its capability against antiship cruise missiles by making changes to its blast fragmentation warhead and guidance system. It also includes improvements to the AEGIS Weapon System (AWS), AN/SPY-1 radar, the Weapon Control System, and the Command and Decision System.

The THAAD System incorporates a new hit-to-kill missile and radar and a new BM/C^4I system. THAAD will provide a capability to engage ballistic missiles at longer ranges and at higher altitudes than the other two systems, thus providing the combat commander with a two-tiered defense that will allow for multiple engagements of incoming missiles with systems that possess different capabilities.

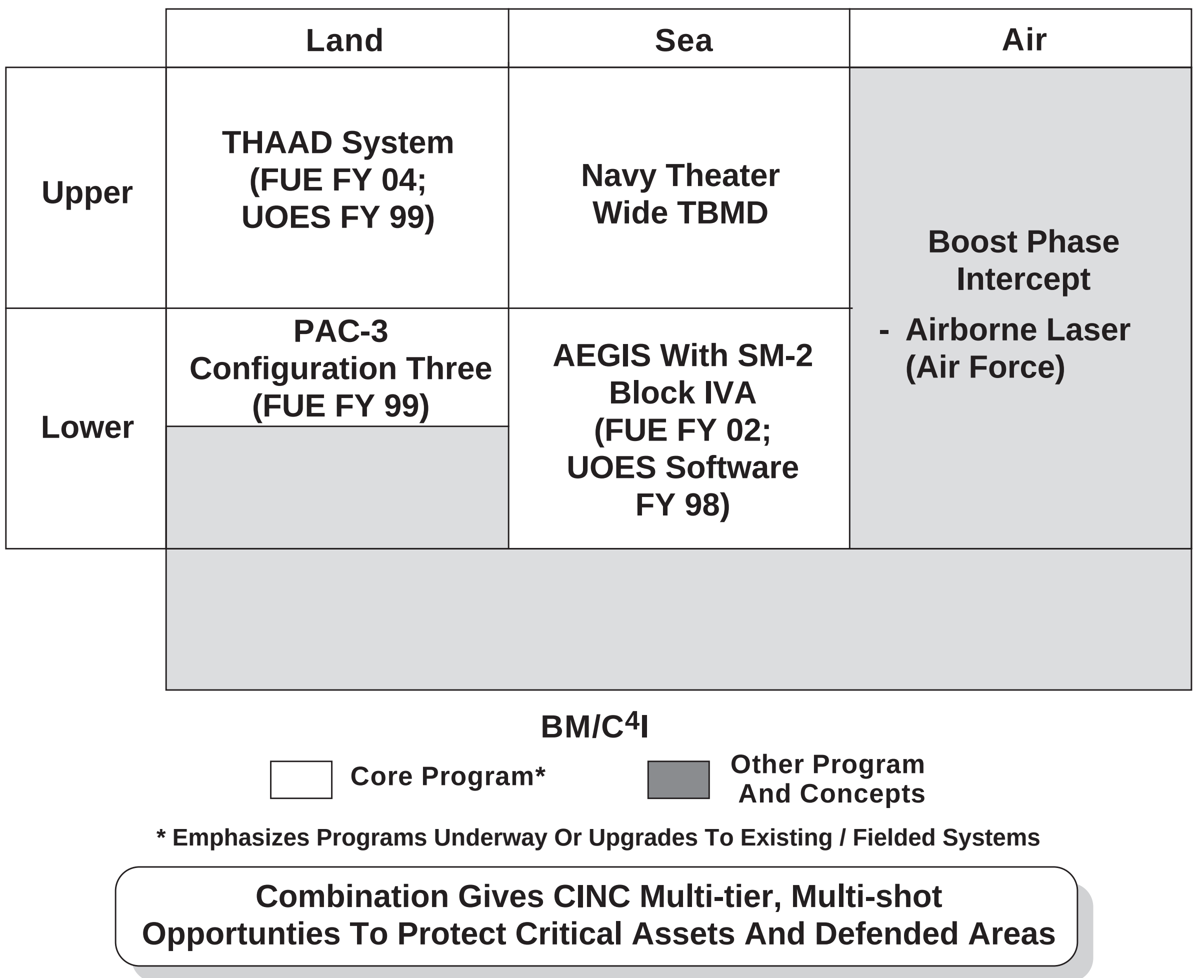
The Navy Theater Wide TBMD Program will build on the AEGIS infrastructure by evolving the Navy's Area TBMD capability through combat system improvements and development of an interceptor with an exoatmospheric capability.

The combination of the four core systems working autonomously or in unison will greatly enhance the probability of destroying incoming missiles before they can affect the critical assets in a theater of operations. Figure 2-11 shows the core programs inserted into the TMD active defense framework. The following sections discuss the status of the core programs.

2.9.1.1 Phased Array Tracking to Intercept Of Target (PATRIOT) Advanced Capability-3 (PAC-3)

The PAC-3 program will increase system battlespace and lethality capabilities through a series of upgrades to the PATRIOT ground system and through the use of the new PAC-3 missile (previously called Extended Range Intercept Technology (ERINT)). Planned radar enhancements will increase detection range; improve target classification, discrimination, and identification; improve the engagement of targets with reduced radar signatures; increase target handling capability; increase firepower; and enhance survivability. Planned launcher enhancements will increase

Figure 2-11. TMD Active Defense Framework-Core Programs



remote launcher capability, thus extending the battlespace. PAC-3 is designed to counter aircraft, tactical ballistic missiles, and cruise missiles.

The PAC-3 upgrades will be implemented through a series of fielded configurations. Configuration One consists of an expanded weapons control computer, optical disk, embedded data recorder, and pulse doppler processor. Software associated with these hardware improvements along with other software improvements will be fielded as part of Configuration One, which had its FUE in FY 1996.

Configuration Two consists of Communications Enhancements Phase I; two software improvements – the counter anti-radiation missile and Classification, Discrimination and Identification (CDI) Phase I; and implementation, via software, of the full capability of the Radar Enhancements Phase II hardware (the pulse doppler processor fielded in Configuration One). Configuration Two will be implemented by the Post Deployment Build-4 software and had its FUE in early FY 1997.

Configuration Three consists of seven major improvements. Four of them are hardware improvements: the PAC-3 missile, Radar Enhancements Phase III, CDI Phase III, and Remote Launch/ Communications Enhancements Upgrade Phase III. The three software upgrades consist of PATRIOT/THAAD Interoperability, Joint TMD Interoperability, and Launch Point Determination. Configuration Three will be implemented by Post Deployment Build-5 software and will have its FUE in late FY 1999.

In the second quarter of FY 1994, the Army selected the ERINT missile for the PAC-3 Program. An independent review of the ERINT selection performed by OSD prior to the PAC-3 Defense Acquisition Board (DAB) supported the Army decision. ERINT is a hit-to-kill interceptor that provides active defense against TBMs and air breathing threats. It uses an onboard active Ka-band seeker, aerodynamic control vanes, and impulse attitude control thrusters to provide the rapid maneuvering necessary for a hit-to-kill intercept. Hit-to-kill technology, as opposed to blast fragmentation, will increase lethality against WMD.

The Dem/Val flight test program, which consisted of two controlled test flights and four guided test flights, successfully demonstrated the PAC-3 missile's hit-to-kill capability against a low altitude air breathing target and ballistic tactical target vehicles with simulated chemical submunitions and bulk chemical warheads.

Developmental and operational test and evaluation will start in FY 1997 and be completed in the third quarter of FY 1999. PAC-3 missile fielding will begin in the fourth quarter of FY 1999.

The following tables provide information specified in the Conference Report, Section 234(e)(1) and (2), accompanying S. 1124, the National Defense Authorization Act for Fiscal Year 1996. This requirement calls for "a description of technical milestones, the schedule, and the cost of each phase...for each TMD acquisition program." The requirement also asks for a description of the variances in the technical milestones, program schedule milestones, and costs compared to both (1) the report submitted the previous year, and (2) the report submitted the first (initial) year. Information based on the FY 1997 President's Budget will be considered the "initial" and "previous" estimate while the FY 1998 President's Budget will serve as the basis for the "current" estimate. Tables 2-1A, 2-1B, and 2-1C provide information on the PATRIOT PAC-3 Program.

FY 1996 efforts resulted in the following accomplishments:

- PAC-3 EMD program was restructured to add schedule and resources to the program to reduce program risk and ensure a successful FUE in the fourth quarter of FY 1999;
- Obtained full materiel release on Configuration One; five of ten U.S. battalions modified;
- Conducted Critical Design Review (CDR) and Initial Production Readiness Reviews of the PAC-3 missile;
- Continued Radar Phase III modification kit procurement and conducted LPA demo for CDI Phase III and Remote Launch/Communication Enhancements Upgrade kit procurement;

Table 2-1A. PAC-3 Program Cost Summary

	Total Previous Years (TY)	FY 97	FY 98	FY 99	FY 00	FY 01	FY 02	FY 03	To Complete	Total (TY)	Total (BY)	Previous Year Total (BY)
RDT&E	1,845	381	206	101	0	0	0	0	0	2,533		
Proc	758	219	351	357	462	448	435	398	462	3,905		
MILCON	1	0	0	0	0	0	0	0	0	1		
Cost	2,604	600	557	473	462	448	435	398	462	6,439		

Explanation Of Variance From Previous:

- **Transfer Of Procurement Funds To Army Beginning In FY 1998.**
- **$1,349M In FY 96 MILCON To Support Construction Of New MAB Facility At WSMR.**

Table 2-1B. PAC-3 Program Milestones

Program Schedule Milestones	Current Estimate	Previous Estimate	Initial Estimate	Explanation Of Variance From Previous
Milestone I - Dem / Val				
• Contract Award				
• System Requirements Review				
• System Design Review				
• Development Test				
Milestone II - EMD				
• Contract Award	1Q FY 95	1Q FY 95	1Q FY 95	
• Preliminary Design Review	4Q FY 95	4Q FY 95	4Q FY 95	
• Critical Design Review	2Q FY 96	2Q FY 96	2Q FY 96	
Milestone III - Production				
• LRIP Contract Award	2Q FY 98	2Q FY 98	2Q FY 98	
• First Unit Equipped (FUE)	4Q FY 99	4Q FY 99	4Q FY 99	
• FRP Contract Award	1Q FY 00	1Q FY 00	1Q FY 00	

Table 2-1C. PAC-3 Technical Milestones

Technical Milestones	Current Estimate	Previous Estimate	Initial Estimate	Explanation Of Variance From Previous
Milestone I - Dem / Val				
• Developmental Test				
Milestone II - EMD				
• Development Test Start	3Q FY 97	3Q FY 97	3Q FY 97	
• Operational Test Start	2Q FY 99	2Q FY 99	2Q FY 99	
• System Integration Test	4Q FY 98	4Q FY 98	4Q FY 98	
Milestone III - Production				
• MSE Start	4Q FY 98	4Q FY 98	4Q FY 98	

- Continued TMD/THAAD integration and cueing software program to provide the basis for interoperability within TMD via JTIDS TADIL-J messages to the THAAD battery tactical operations center;
- Continued Live Fire Testing and Evaluation (LFT&E) testing;
- Participated in Mountain Top Cruise Missile Defense Advanced Concept Technology Demonstration (ACTD);
- Conducted Configuration Two contractor development test and evaluation, force development test and experimentation, and follow-on operational test and evaluation;
- Continued PAC-3 EMD target and test support and risk reduction and mitigation efforts;
- Provided resources for PAC-3 missile assembly building modification.

Work planned for FY 1997:

- Field first Configuration Two-equipped PATRIOT unit;
- Continue PAC-3 missile EMD program with formal flight testing, target and test support, LFT&E effort, and risk reduction and mitigation efforts;
- Continue Radar Phase III modification kit procurement;
- Conduct CDI Phase III PQT, and initiate modification kit procurement;
- Conduct Remote Launch/Communications Enhancement Upgrade PQT;
- Initiate limited procurement of Enhanced Launcher Electronics System and fire solution computer, and Remote Launch/Communications Enhancements Upgrade modification kits.

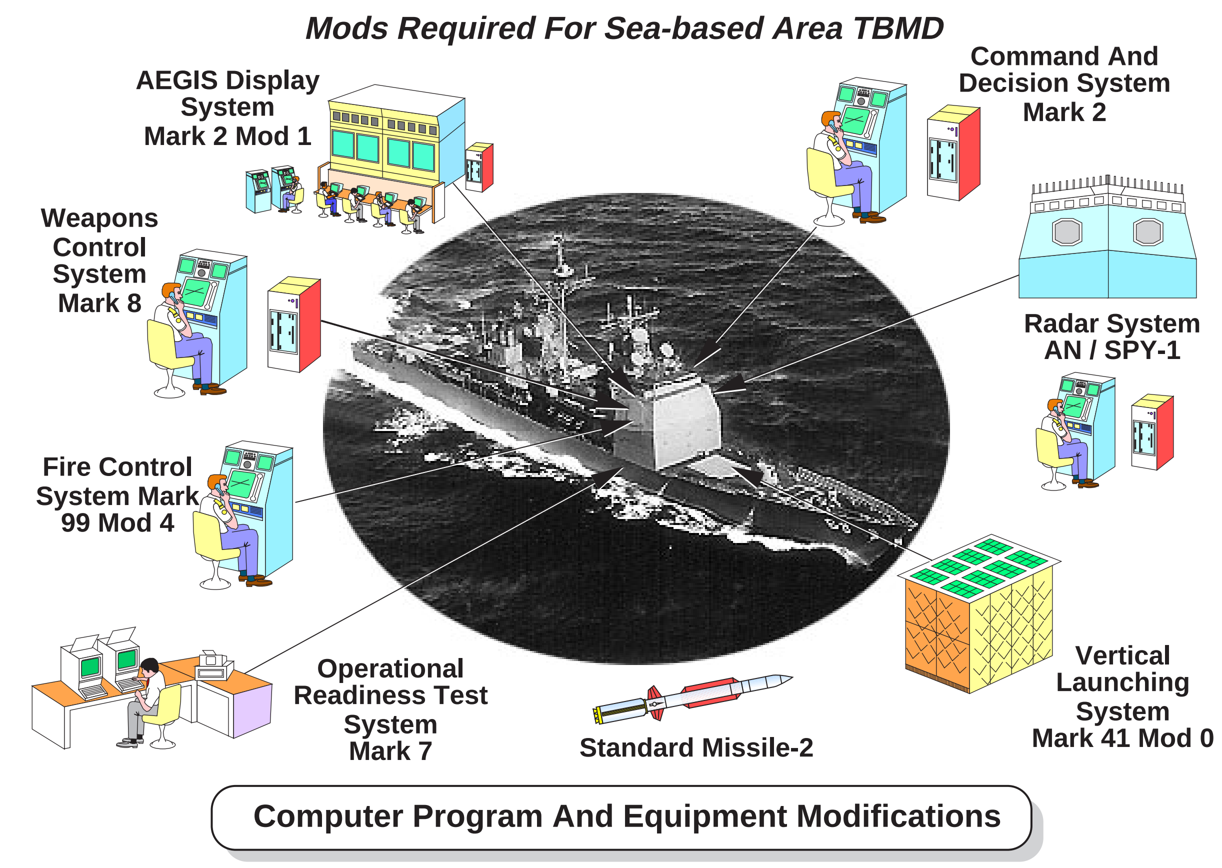
Work planned for FY 1998:

- Obtain PAC-3 missile Low Rate Initial Production (LRIP) approval;
- Initiate LRIP of the PAC-3 missile;
- Continue PAC-3 EMD missile flight test program, target and test support, LFT&E testing, and risk mitigation efforts;
- Continue Radar Phase III, CDI Phase III, and Remote Launch/Communications Enhancements modification kit procurement;
- Conduct Configuration Three contractor development test and evaluation, and force development test and experimentation.

2.9.1.2 Navy Area TBMD

The goal of the Navy Area TBMD program is to provide a sea-based TBMD capability by building on the existing AWS. The program will focus on (1) modifying AWS, including the Vertical Launch System (VLS), to enable TBM detection, tracking, and engagement, and (2) improving the STANDARD Missile-2 Block IV (SM-2 Block IV) seeker, autopilot, fuze, and warhead. Figure 2-12 highlights the modifications required for each element of the AWS; Figure 2-13 highlights the modified SM-2 Block IV (designated SM-2 Block IVA).

Figure 2-12. AEGIS Weapon System

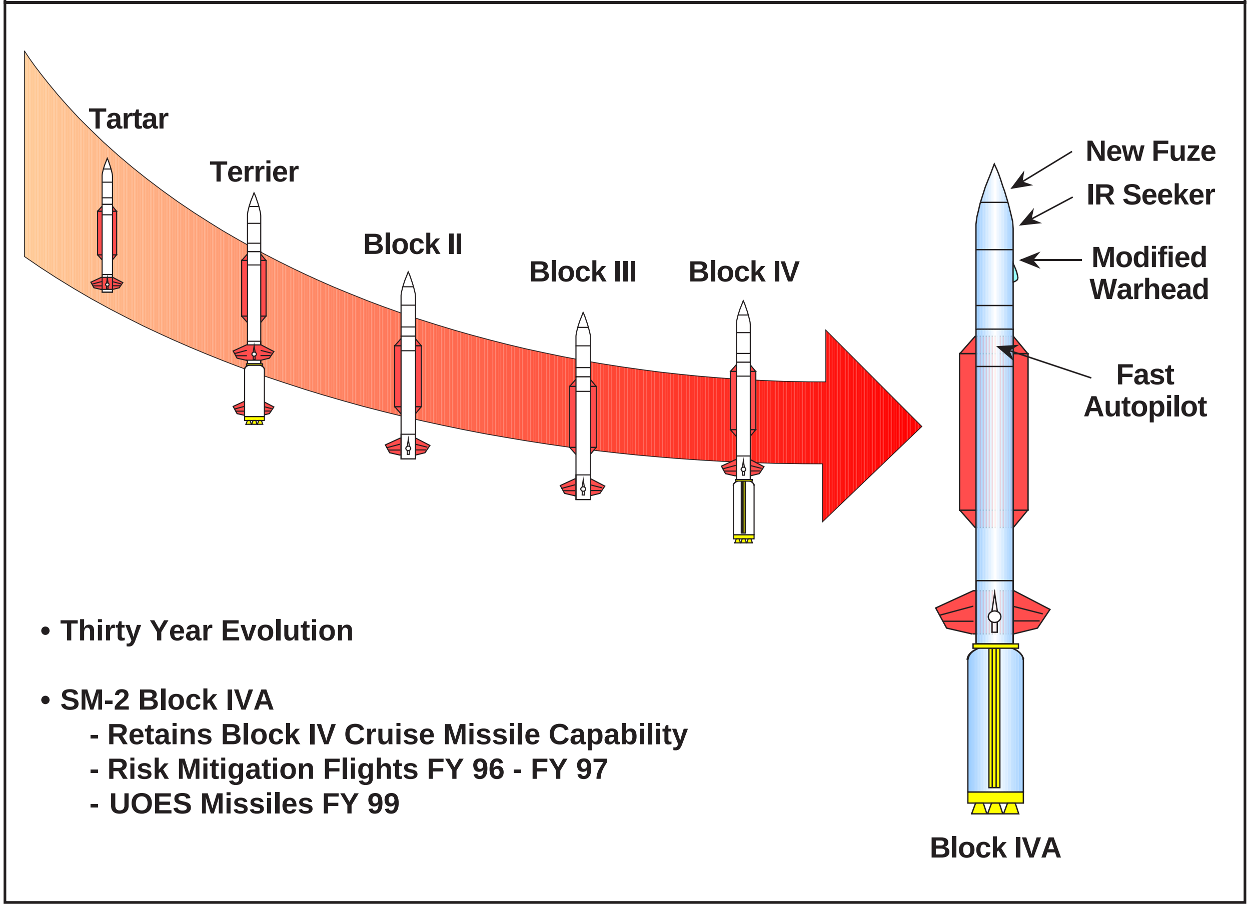


The AN/SPY-1 radar computer programs and equipment will be modified to allow search at higher elevations and longer ranges to detect and track ballistic targets while maintaining an Anti-Air Warfare (AAW) capability. The modified AWS will be able to predict intercept points and engagement boundaries for ballistic targets, initialize missiles, conduct firings, and provide uplink commands as the missile flies to intercept a TBM.

AEGIS displays and onboard command and decision system computer programs and equipment will be modified to display TBM tracks and engagements and to interface with other elements of the combat system, as well as with off-ship sensors (e.g., DSP).

The following changes to the baseline SM-2 Block IV will improve intercept performance against ballistic missiles within the atmosphere:

Figure 2-13. STANDARD Missile-2 Modifications



- An infrared seeker will increase the probability of direct hits;
- Autopilot modifications will improve missile maneuverability;
- Fuze improvements will increase lethality in high closing rate missile-to-missile encounters; and
- Warhead modifications will improve lethality against TBMD and AAW targets by capitalizing on engineering analysis and design efforts already completed for the PATRIOT missile.

The test and evaluation program for Navy Area TBMD is an outgrowth of over 20 years of computer program development and management, missile development, and AWS engineering. It includes early missile hardware integration and flight test, infrared seeker wind tunnel and sled testing, warhead development using lessons learned from PATRIOT, early at-sea testing of prototypical computer programs, and extensive land-based development of AWS computer programs and equipment at the Combat System Engineering Development (CSED) site in Moorestown, New Jersey.

A successful at-sea experiment was conducted in June 1995 to demonstrate the extended tracking capability of the AEGIS Combat System (ACS) and SPY-1 radar acquisition, and the use of off-ship cueing sources. The objectives of the experiment were to: (1) demonstrate SPY-1 radar ability to detect and track a TBM; (2) demonstrate the ability of the AWS to receive a national or remote TBM cue and initiate TBM search, proving TRE interface with AWS and TBM message processing; (3) demonstrate the ability of AWS to support multiunit coordinated TBMD operations through the exchange of TBM data via tactical data links; (4) gather engineering data to support continuing systems design studies to optimize anti-air warfare system and TBMD capabilities; and (5) gather data to support discrimination algorithm studies. This non-firing exercise employed two AEGIS class cruisers to detect and track one dedicated TBM target. Cueing by a space-based warning system or remote sensors and ship-to-ship cueing and data exchange was demonstrated. The test occurred at the Pacific Missile Range Facility (PMRF), Barking Sands, Hawaii, using a Sandia National Laboratories STRYPI IX missile. All of the test objectives were successfully completed.

The SM-2 Block IV successfully completed an operational assessment and commenced LRIP in FY 1995. This missile upgrade is the basis for the initial sea-based TBMD capability that focuses on the more numerous, shorter-range, lower-apogee threats. Future efforts will focus on improving the guidance of the Block IVA to effect increased lethality against emerging threats including chemical submunitions and other WMD. The August 1994 DAB review of Navy TBMD endorsed this evolutionary approach and approved risk reduction activities leading to a Milestone II DAB review in FY 1997.

A series of progressively challenging flight tests using SM-2 IR Seeker Risk Reduction missiles is currently underway at White Sands Missile Range (WSMR). An Engineering Test Round (ETR), successfully flown in August 1996, demonstrated missile functionality and verified aero-thermal models. Three Development Test Rounds (DTR) tests are planned against TBM representative targets. DTR-1a, successfully flown at WSMR in January 1997, demonstrated infrared seeker functionality and missile lethality with a fragmentation warhead against a Lance target, thereby completing a critical exit criteria that led to a Milestone II decision in February 1997 to proceed to EMD.

In addition to the early risk reduction test rounds, 13 missiles (including three inert operational missiles) will be procured for developmental testing at WSMR. During early EMD, two AEGIS cruisers will receive the initial version of the TBMD software, along with minor hardware upgrades, providing a UOES for user feedback during the development process. This interim system will provide the opportunity to evaluate organizational and doctrinal concepts in support of the follow-on tactical capability. In FY 1999, the initial missiles from the lot of 35 missiles procured for Technical and Operational Evaluation (TECHEVAL and OPEVAL) (beginning in FY 2001) will be delivered and could be made available for use by the two UOES cruisers. Based on a predetermined schedule, these missiles will be used in the 25 TECHEVAL and OPEVAL flight tests. The remaining missiles will constitute the UOES inventory, which will provide an interim TBMD capability prior to the installation of tactical software and hardware upgrades in 79 AEGIS Cruisers and Destroyers, and the initial delivery of LRIP missiles beginning in FY 2001.

The following tables provide information specified in the Conference Report, Section 234(e)(1) and (2), accompanying S. 1124, the National Defense Authorization Act for Fiscal Year 1996. This requirement calls for "a description of technical milestones, the schedule, and the cost of each phase...for each TMD acquisition program." The requirement also asks for a description of the variances in the technical milestones, program schedule milestones, and costs compared to both (1) the report submitted the previous year, and (2) the report submitted the first (initial) year.

Information based on the FY 1997 President's Budget will be considered the "initial" and "previous" estimate while the FY 1998 President's Budget will serve as the basis for the "current" estimate. Tables 2-2A, 2-2B, and 2-2C provide information on the Navy Area TBMD Program.

FY 1996 efforts resulted in the following accomplishments:

- Continued AEGIS computer program and equipment development;
- Conducted AWS UOES TBMD Preliminary Design Review (PDR);
- Developed design specifications;
- Continued detailed missile design and conducted PDR;
- Commenced risk reduction flight tests at WSMR to resolve issues of aero-thermal blur, infrared seeker performance, infrared cover survivability, and model simulation;
- Continued command and control processor development and implementation of TBMD messages on LINK-11 and LINK-16;
- Commenced procurement of AWS modifications for ships and development sites and support and training equipment for shore facilities.

Work planned for FY 1997:

- Complete risk reduction flight tests at WSMR to resolve issues of aero-thermal blur, infrared seeker performance, infrared cover survivability, and model simulation;
- Continue development of tactical computer program, start development of computer program design specification, and conduct system design and PDR;
- Commence missile engineering and manufacturing development, conduct CDR, complete detailed missile design, initiate fabrication of UOES/WSMR missiles, initiate procurement of Developmental Test and Operational Test (DT/OT) flight test missiles;
- Continue systems engineering and analysis;
- Procure test targets and conduct test planning;
- Define interface for TBMD-related upgrades to AEGIS and Joint Maritime Command Information System (JMCIS);
- Continue command and control processor development;
- Procure AWS modifications for ships and development sites and support and training equipment for shore facilities.

Work planned for FY 1998:

- Deliver AEGIS UOES computer program, conduct CDR for tactical program, and initiate tactical program testing at CSED site;
- Deliver WSMR development test missiles;

Table 2-2A. Navy Area TBMD Program Cost Summary

	Total Previous Years (TY)	FY 97	FY 98	FY 99	FY 00	FY 01	FY 02	FY 03	To Complete	Total (TY)	Total (BY)	Previous Year Total (BY)
RDT&E	633	301	268	227	222	159	52	38	154	2,054		
Proc	30	9	15	45	130	161	236	225	805	1,656		
MILCON	0	0	0	0	0	0	0	0	0	0		
Cost	663	310	283	272	352	320	288	263	959	3,710		

Explanation Of Variance From Previous:

- **Transfer Of Procurement Funds To Navy Beginning In FY 1998.**

Table 2-2B. Navy Area TBMD Program Milestones

Program Schedule Milestones	Current Estimate	Previous Estimate	Initial Estimate	Explanation Of Variance From Previous
Milestone I - Dem / Val	N/A			
• Contract Award				
• System Requirements Review				
• System Design Review				
• Development Test				
Milestone II - EMD	2Q FY 97	4Q FY 96	4Q FY 96	ETR And DTR-1 No Tests Caused Extensive Delays
• Contract Award	2Q FY 97	4Q FY 96	4Q FY 96	
• Preliminary Design Review	3Q FY 97	3Q FY 96	3Q FY 96	
• Critical Design Review - Missile	2Q FY 97	4Q FY 96	4Q FY 96	
• Critical Design Review - AEGIS Tactical	2Q FY 98	3Q FY 97	3Q FY 97	
Milestone III - Production	2Q FY 02	2Q FY 01	2Q FY 01	Flight Test Delays
• LRIP Contract Award	2Q FY 01	3Q FY 01	3Q FY 01	
• First Unit Equipped (FUE)	1Q FY 02	2Q FY 02	2Q FY 02	
• FRP Contract Award	3Q FY 02	2Q FY 01	2Q FY 01	

Table 2-2C. Navy Area TBMD Technical Milestones

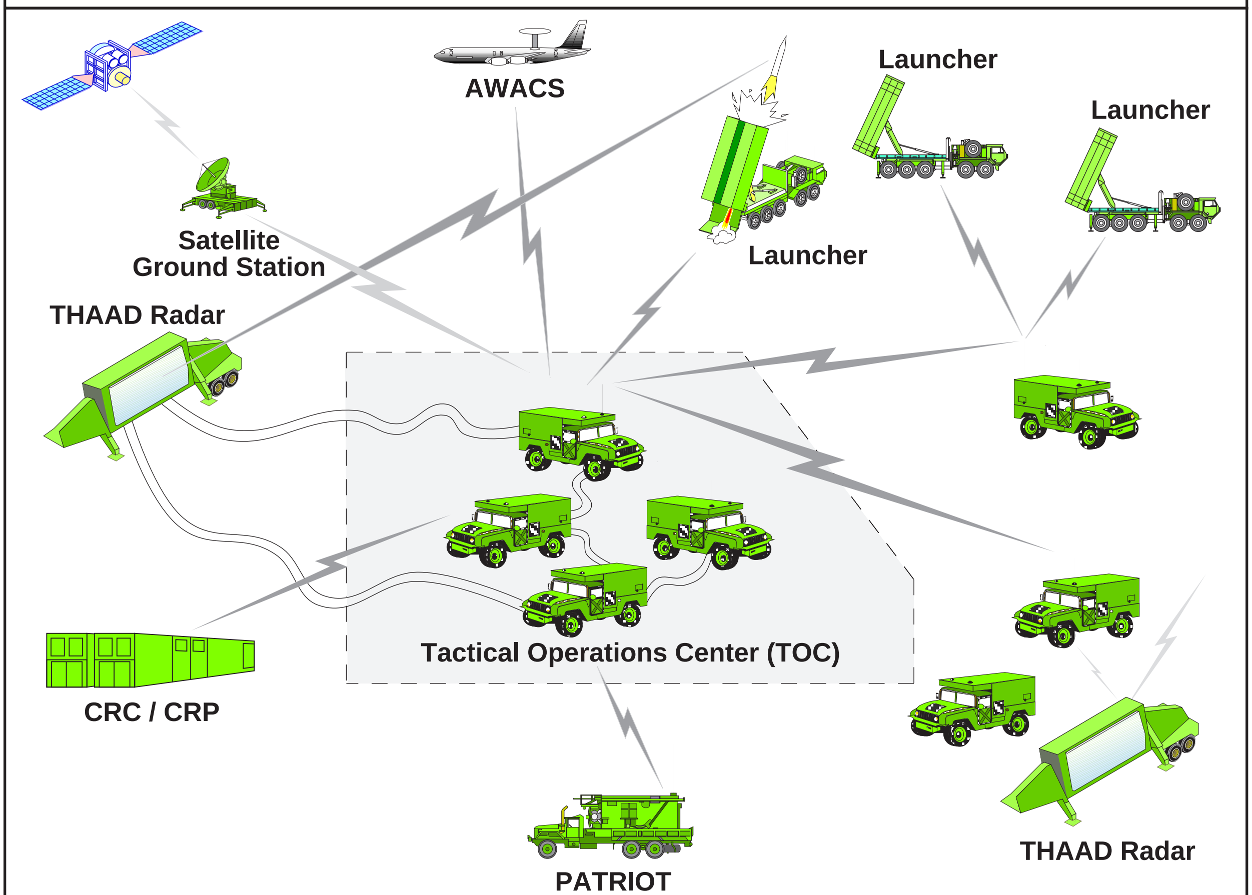
Technical Milestones	Current Estimate	Previous Estimate	Initial Estimate	Explanation Of Variance From Previous
Milestone I - Dem / Val	N/A			
• Developmental Test				
Milestone II - EMD	2Q FY 97	4Q FY 96	4Q FY 96	Flight Test Delays
• Development Test Start - Land Based	4Q FY 99	2Q FY 00	2Q FY 00	Adjustment Of Test Plans
• Developmental Test Start - Sea Based	3Q FY 01	2Q FY 01	2Q FY 01	Reevaluation Of UOES Requirements
• Operational Test Start	4Q FY 01	2Q FY 01	2Q FY 01	
Milestone III - Production - MSE Start	2Q FY 02	2Q FY 02	2Q FY 02	

- Initiate fabrication of at-sea development and operational test missiles;
- Continue systems engineering and analysis;
- Continue implementation of JMCIS TBMD segments and TBMD messages in the command and control processor;
- Commence upgrades at PMRF to support DT/OT;
- Continue AWS modifications procurement for ships.

2.9.1.3 The Theater High Altitude Area Defense (THAAD) System

The THAAD system, shown in Figure 2-14, is being developed to negate theater ballistic missiles at long range and high altitudes. Its long-range intercept capability will protect broad areas, dispersed assets, and population centers against TBM attacks. The THAAD system includes radars, BM/C^{4}I units, missiles, launchers, and support equipment. The THAAD radar provides threat early warning, threat type classification, interceptor fire control, external sensor cueing, launch and impact point estimates for the THAAD system. The THAAD radar is based on state-of-the-art, solid-state, X-band radar technologies. THAAD will be interoperable with both existing and future air defense systems. This netted and distributed BM/C^{4}I architecture will provide robust protection across the TBM threat spectrum. THAAD is pursing integration of THAAD BM/C^{4}I

Figure 2-14. The THAAD System



with the Project Manager, Air Defense Command and Control System, to take advantage of previous Army developments that can be incorporated into the THAAD program.

The THAAD missile is a single-stage, solid-fuel missile employing thrust vector technology and a divert and attitude control system. Predicted intercept point and guidance presets are provided by the THAAD radar to the missile prior to launch. The THAAD missile receives in-flight updates including a target object map for target designation. Terminal guidance data is provided by an infrared seeker looking through a side-mounted, uncooled window. The seeker window is protected by a shroud that separates prior to terminal homing. The THAAD missile kill vehicle exhibits enhanced lethality by destroying incoming warheads utilizing kinetic energy impact (hit-to-kill). It is capable of both endoatmospheric and exoatmospheric intercepts.

The THAAD launcher contains a missile-round pallet mounted on a modified U.S. Army Palletized Loading System (PLS) truck. Primary power to the launcher is supplied by lead acid batteries that are automatically recharged by a quiet tactical generator. Launch position is determined by the global positioning system and the launch azimuth by a direction reference unit.

The PD/RR program (formerly referred to as Dem/Val) will develop a design for the objective THAAD system and demonstrate the capabilities of the system in a series of flight tests. The residual hardware resulting from the THAAD PD/RR program, including the UOES option, will be used for a prototype UOES system. The UOES, used primarily for early operational assessment, will also be available for limited use as a contingency capability during a national emergency. The UOES is projected to consist of 40 missiles with 4 launchers, 2 BM/C^4I units, 2 radars, and support equipment. The objective system design will be developed and tested in the EMD phase and will lead to LRIP and subsequent fielding in FY 2004.

The PD/RR flight test program will be continuing at WSMR during FY 1997. The flight test schedule consists of 11 flight and system tests. The PD/RR flight test program has been revised from 14 to 11 flights in order to allow greater time for data analysis between tests, while still collecting all data required to meet the Milestone II exit criteria. The first 9 PD/RR flights support the Milestone decision and the two additional flight tests will serve as backup tests.

THAAD’s first flight occurred on April 21, 1995. This test successfully demonstrated the correct operation of the THAAD missile propulsion system, booster/kill vehicle separation, seeker shroud cover deployment, collection of seeker data, uplink/downlink communications for the WSMR Radar Interface Unit to the missile, and preplanned command destruct of the missile. The second flight occurred on July 31, 1995 and, like the first flight, was not a planned intercept attempt and did not include a target. Objectives accomplished during this test included execution of the THAAD Energy Management Steering (TEMS) maneuver, booster/kill vehicle separation, and execution of midcourse guidance maneuvers based on information from the surrogate radar. Because the missile flare did not deploy, the missile was moving faster and higher than its planned course. Missile software plotted a new fly out trajectory to achieve intercept of a simulated target trajectory, but the flight had to be terminated earlier than planned due to range safety concerns.

The third flight test was the first to involve a target missile, but was an intentional flyby in order to characterize the seeker. This test achieved its objectives and also verified the corrective actions taken as a result of flight test 2. Flight tests 4, 5, and 6 were all unsuccessful attempts to intercept a target. Flight 4 (December 13, 1995) achieved a significant portion of its objectives, but a software error in the avionics processor caused the missile to perform an errant maneuver during flyout. Though the missile performed a significant midcourse correction and was on a path to intercept the target, it depleted its divert and attitude control system fuel just prior to intercept. An intercept was not achieved, but the missile seeker did acquire, track, and designate the target and the THAAD radar successfully participated in shadow mode. During flight test 5 (March 22, 1996), the missile failed to execute in-flight commands following booster separation. The problem was traced back to an anomalous short circuit during faulty booster separation. This served to reset the avionics processor to prelaunch status and, as a result, the missile continued on a ballistic trajectory until destroyed by range safety. Flight test 6 (July 15, 1996) verified corrective action taken after flight test 5 and represented the best overall performance of the THAAD system, but did not achieve intercept due to a seeker anomaly which caused half of the focal plane array to become inoperative. The failure investigation determined the most likely cause was contamination. Flight tests 5 and 6 did successfully demonstrate operation of the THAAD radar in shadow mode.

Flight Test 7 (FT-7) was conducted on March 6, 1997, at White Sands Missile Range. Although a body-to-body intercept was not achieved, the launcher, radar, and BM/C^{3}I segments all performed nominally and several important mission criteria were met. Preliminary findings indicate that the Divert and Attitude Control System (DACS) or a component of the DACS malfunctioned. Investigators have created a fault tree and are focusing on the DACS valves or valve drivers. Test personnel are conducting simulations of Flight Test-7 to possibly duplicate the test result and discover the exact cause.

The EMD phase of the THAAD Program will begin in FY 1998 with completion of the Milestone II DAB review and award of the EMD contract.

The following tables provide information specified in the Conference Report, Section 234(e)(1) and (2), accompanying S. 1124, the National Defense Authorization Act for Fiscal Year 1996. This requirement calls for “a description of technical milestones, the schedule, and the cost of each phase...for each TMD acquisition program.” The requirement also asks for a description of the variances in the technical milestones, program schedule milestones, and costs compared to both (1) the report submitted the previous year, and (2) the report submitted the first (initial) year. Information based on the FY 1997 President’s Budget will be considered the “initial” and “previous” estimate while the FY 1998 President’s Budget will serve as the basis for the “current” estimate. Tables 2-3A, 2-3B, and 2-3C provide information on the THAAD Program.

FY 1996 efforts resulted in the following accomplishments:

- Completed missile flight test program and began system flight test program with BM/C^{4}I THAAD radar, and PLS launcher;
- Continued THAAD system ground testing to mitigate flight test risk;
- Continued lethality simulation code validation, hit-to-kill lethality analysis, system threat assessment, nuclear environment survivability analysis, and hit assessment, discrimination, and guidance, navigation and control algorithm development;

Table 2-3A. THAAD Program Cost Summary

	Total Previous Years (TY)	FY 97	FY 98	FY 99	FY 00	FY 01	FY 02	FY 03	To Complete	Total (TY)	Total (BY)	Previous Year Total (BY)
RDT&E	2,444	619	556	595	603	585	414	373	179	6,368		
Proc	0	0	0	0	0	34	534	608	5,247	6,423		
MILCON	13	0	5	0	0	0	0	5	0	23		
Cost	2,457	619	561	595	603	619	948	986	5,426	12,814		

Explanation Of Variance From Previous:

- **DoD Added $722M To RDT&E And Removed Procurement Funding**
- **Procurement Funding Transferred To The Services Beginning In FY 1998**

Table 2-3B. THAAD Program Milestones

Program Schedule Milestones	Current Estimate	Previous Estimate	Initial Estimate	Explanation Of Variance From Previous
Milestone I - Dem / Val	2Q FY 92		2Q FY 92	
• Contract Award	4Q FY 92		4Q FY 92	
• System Requirements Review	2Q FY 95		2Q FY 95	
• System Design Review	3Q FY 96		3Q FY 96	
• Development Test	3Q FY 95		3Q FY 95	
Milestone II - EMD	2Q FY 98		2Q FY 97	PD / RR Flight Test Delays
• Contract Award	2Q FY 98		3Q FY 97	PD / RR Flight Test Delays
• Preliminary Design Review	4Q FY 98		2Q FY 98	PD / RR Flight Test Delays
• Critical Design Review	4Q FY 00		2Q FY 99	PD / RR Flight Test Delays
Milestone III - Production	4Q FY 04		4Q FY 04	
• LRIP Contract Award	2Q FY 02		1Q FY 03	PBD 224 Accelerates FUE To FY 04
• First Unit Equipped (FUE)	4Q FY 04		2Q FY 06	PBD 224 Accelerates FUE To FY 04
• FRP Contract Award	1Q FY 05		2Q FY 05	PBD 224 Accelerates FUE To FY 04

Table 2-3C. THAAD Technical Milestones

Technical Milestones	Current Estimate	Previous Estimate	Initial Estimate	Explanation Of Variance From Previous
Milestone I - Dem / Val				
• Developmental Test	3Q FY 95		3Q FY 95	
Milestone II - EMD				
• Development Test Start	4Q FY 00		4Q FY 00	
• Operational Test Start	2Q FY 02		2Q FY 02	
Milestone III - Production				
• FUE	4Q FY 04		2Q FY 06	PBD 224 Accelerates FUE To FY 04

- Conducted System Design Review (SDR);
- Completed factory string tests on UOES radars and fabrication and integration of UOES radars and delivery to WSMR;
- Continued integration and testing of JTIDS, launch support, BM/C^4I, weapon system deck model, and simulation efforts;
- Maintained integrated logistics and product assurance efforts.

Work planned for FY 1997:

- Exercise UOES missile option;
- Conduct Software Specification Review and SDR update;
- Conduct radar characterization tests at WSMR and the United States Army Kwajalein Atoll (USAKA) in conjunction with Theater Critical Measurements Program (TCMP-2);
- Continue system flight test program;
- Begin radar Monolithic Microwave Integrated Circuit producibility and yield improvements for EMD;
- Continue nuclear environment survivability analysis;
- Continue hit assessment, discrimination, and guidance, navigation and control algorithm development, hit-to-kill lethality analysis, and system threat assessment;
- Continue integration and testing of JTIDS, launch support, BM/C^4I, weapon system deck model, and simulation efforts.

Work planned for FY 1998:

- Conduct Milestone II DAB review;
- Award EMD Contract;
- Begin software maintenance;
- Continue radar Monolithic Microwave Integrated Circuit producibility and yield improvements for EMD;
- Continue objective system design engineering, software independent verification and validation, nuclear environment survivability analysis, hit assessment, discrimination, and guidance, navigation and control algorithm development, hit-to-kill lethality analysis, and system threat assessment;
- Continue integration and testing of JTIDS, launch support, BM/C^4I, weapon system deck model, and simulation efforts;
- Conduct Limited User Test.

2.9.1.4 Navy Theater Wide Theater Ballistic Missile Defense (TBMD)

The Navy Theater Wide (NTW) TBMD Program will provide an upper-tier, sea-based capability to counter medium- to long-range TBM threats. The program builds on the existing AWS and STANDARD Missile infrastructure as a further evolution to the Navy Area TBMD System. The AWS will be modified to support exoatmospheric ascent and descent phase engagements. The STANDARD Missile Block IV will be modified to include a third stage rocket motor and fourth stage Lightweight Exoatmospheric Projectile (LEAP) kinetic warhead utilizing an infrared seeker.

The current NTW program is consistent with the direction of last year's BMD Program Review. This program consisted of three parallel efforts. The first of these efforts is a kinetic warhead technology assessment. This review is examining technologies including LEAP, THAAD, the Atmospheric Interceptor Technology (AIT) program, and the Exoatmospheric Kill Vehicle (EKV) program. This review will ensure the Department is pursuing the appropriate kinetic warhead solution for the NTW system. The Department will make a decision on the correct approach for NTW in FY 1998.

In parallel with the technology review, BMDO and the Navy are proceeding to a system level intercept, called the NTW Flight Demonstration Program (FDP) or AEGIS LEAP Intercept (ALI). The FDP/ALI is using a derivative of the LEAP kinetic warhead used in the previous BMDO and Navy Terrier LEAP intercept attempts. This kinetic warhead will be integrated with components of the Navy STANDARD Missile-2 Block IV. The resulting theater-wide missile will be called the STANDARD Missile-3 (SM-3). The FDP/ALI flights will be conducted from an AEGIS ship at the PMRF. The Navy will modify an Area TBMD UOES ship as necessary to support the FDP/ALI flights. The current plan includes a series of eight flight tests. The first four, called Control Test Vehicles (CTVs), develop understanding of this missile through incremental testing. The second four, called Guidance Test Vehicles (GTVs), will intercept a TBM target. The first intercept will be approximately the second quarter of FY 2000.

The third portion of the NTW program is risk reduction activities. These activities will examine the critical risk areas for NTW engineering and develop solutions that will allow BMDO, at the appropriate time, to make an informed decision to enter the EMD phase. In addition, they support potential development of an early NTW initial capability (UOES). These risk areas include discrimination, lethality, propulsion, divert, kinetic warhead seeker, BM/C^3I, ship systems, and system engineering.

The Department has declared NTW a "core" TMD program. More significantly, the Department has also declared NTW a pre-Major Defense Acquisition Program (MDAP), a program that may eventually become an MDAP. Accordingly, BMDO and the Navy have initiated the necessary steps to establish NTW as an acquisition program in compliance with DoD 5000 requirements.

The following tables provide information specified in the Conference Report, Section 234(e)(1) and (2), accompanying S. 1124, the National Defense Authorization Act for Fiscal Year 1996. This requirement calls for "a description of technical milestones, the schedule, and the cost of each phase...for each TMD acquisition program." The requirement also asks for a description of the variances in the technical milestones, program schedule milestones, and costs compared to both (1) the report submitted the previous year, and (2) the report submitted the first (initial) year. Since this year's report constitutes the first (initial) submission, no variances will be identified or discussed. Information based on the FY 1998 President's Budget will be considered the "initial" estimate. Tables 2-4A, 2-4B, and 2-4C provide information on the Navy Theater Wide Program.

FY 1996 efforts resulted in the following accomplishments:

- Completed the Navy TBMD COEA Phase I;
- Conducted system and design engineering to support the FDP/ALI flight tests;
- Conducted initial lethality tests for NTW;
- Started the Navy TBMD COEA Phase II to confirm the NTW material alternative.

Work Planned for FY 1997:

- Continue system engineering for the FDP/ALI flight tests;
- Conduct Final Design Review for FDP/ALI missile (SM-3);
- Conduct first flight test (Control Test Vehicle 1);
- Continue LEAP lethality testing;
- Begin Joint Systems Engineering Team studies on kinetic kill vehicle technologies;
- Conduct test of third stage rocket motor;
- Complete Navy TBMD COEA Phase II.

Work Planned for FY 1998:

- Conduct DAB Review to complete Phase 0 activities;
- Continue system engineering for the FDP/ALI flight tests;
- Conduct AWS System Design Review for FDP/ALI;
- Conduct second ALI flight test;
- Conduct ALI target test flight;
- Conduct hover testing of the LEAP SM-3 kinetic warhead.

2.9.2 Corps SAM/Medium Extended Air Defense System (MEADS)

The Corps SAM Program was initiated to provide defense of vital corps and division assets associated with the Army and Marine Corps maneuver forces. The Corps SAM system was being developed to provide: (1) defense against multiple and simultaneous attacks by Short Range Bal-

Table 2-4A. Navy Theater Wide Program Cost Summary

	Total Previous Years (TY)	FY 97	FY 98	FY 99	FY 00	FY 01	FY 02	FY 03	To Complete	Total (TY)	Total (BY)	Previous Year Total (BY)
RDT&E	356	304	195	192	191	191	145	149	432	2,155		
Proc	0	0	0	0	0	0	0	0	0	0		
MILCON	0	0	0	0	0	0	0	0	0	0		
Cost	356	304	195	192	191	191	145	149	432	2,155		

Table 2-4B. Navy Theater Wide Program Milestones

Program Schedule Milestones	Current Estimate	Previous Estimate	Initial Estimate	Explanation Of Variance From Previous
Milestone I - Dem / Val • Contract Award • System Requirements Review • System Design Review • Development Test	 NA TBD TBD FY 00		 NA TBD TBD TBD	
Milestone II - EMD • Contract Award • Preliminary Design Review • Critical Design Review - Missile • Critical Design Review - AEGIS Tactical	TBD		TBD	
Milestone III - Production • LRIP Contract Award • First Unit Equipped (FUE) • FRP Contract Award	TBD		TBD	

Table 2-4C. Navy Theater Wide Technical Milestones

Technical Milestones	Current Estimate	Previous Estimate	Initial Estimate	Explanation Of Variance From Previous
Milestone I - Dem / Val • Developmental Test	FY 00		TBD	
Milestone II - EMD • Development Test Start - Land Based • Development Test Start - Ship Based • Operational Test Start • System Integration Test	TBD		TBD	
Milestone III - Production • MSE Start	TBD		TBD	

listic Missiles (SRBMs), low cross section cruise missiles, Unmanned Aerial Vehicles (UAVs), and other air breathing threats to the force; (2) immediate deployment for early entry operations with as few as six C-141 sorties; (3) mobility to move rapidly and protect maneuver force assets during offensive operations; (4) a distributed architecture and modular components to increase survivability and flexibility of employment in a number of operational configurations; and (5) a significant increase in firepower while greatly reducing manpower and logistics requirements.

In August 1990, the Corps Air Defense Capability MNS was validated by the JROC. The Corps SAM program was approved by the DAB to enter the concept definition phase. A Corps SAM Operational Requirements Document (ORD) was jointly developed and approved by the Army and Marine Corps. The DAB also directed the Corps SAM program to aggressively pursue international cooperation in the development of the Corps SAM system. On February 20, 1995, a Statement of Intent (SOI) was signed with the governments of Germany, France, and Italy to cooperatively develop and produce the MEADS to satisfy the Corps SAM operational requirements as well as the operational requirements of the other nations. The SOI provides the framework for the MEADS Program.

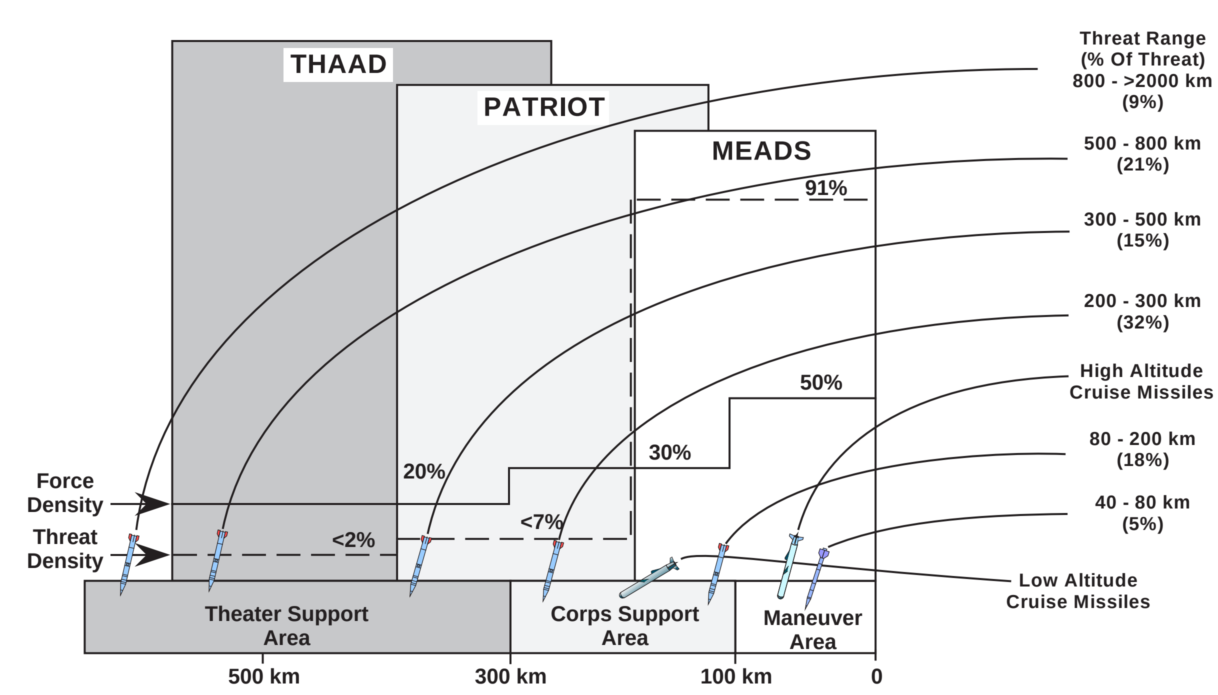
The MEADS Program began as a result of a 1990-92 "Program Cooperative Opportunity Survey." The U.S. Under Secretary of Defense (Acquisition and Technology) (USD(A&T)) invited the German Government to cooperate with the United States in the development of a medium-range air and missile defense system. The French Government also invited the German Government to join the SAMP-T program. In April 1994, a Corps SAM draft Request For Proposal (RFP) was released. The French and German Governments expressed a desire to participate in the Corps SAM program in June 1994. At this time, MEADS was accepted as the acquisition strategy to meet the U.S. Corps SAM requirement.

The MEADS SOI approval initiated MEADS Memorandum of Understanding (MOU) negotiations. A series of nine MOU negotiation meetings were held between February 1995 and February 1996. France withdrew from the MEADS program prior to final approval of the MOU. The MOU was modified to a trilateral MOU and signed by the United States, Italy, and Germany and entered into effect May 28, 1996. The MOU serves as the basis for program execution.

The MEADS will be a lower-tier component of the TMD active defense pillar that will provide low-to-medium altitude air defense, anti-tactical ballistic missile defense, and cruise missile defense. MEADS will be lightweight and modular in order to be highly transportable and mobile. MEADS will provide protection of maneuver forces and point defense of critical assets from early entry through decisive operations against multiple, simultaneous, 360° attacks by various classes of tactical missiles, UAVs, and air breathing threats, which may employ conventional and/or WMD warheads. MEADS will be compatible and interoperable with other Army, Joint Service, and allied systems expected to participate in joint/combined operations in the 21st Century. The MEADS operational requirements were harmonized between the participant countries and documented in the MEADS Initial International Operational Requirements Document dated February 29, 1996.

MEADS will play an important role in a layered missile defense strategy. Approximately 90% of the anticipated missile threats fall into the MEADS area of responsibility. These threats drive the MEADS system design towards a highly mobile and capable air defense system able to provide and receive cueing data from other theater sensors and utilize national sensor data. Figure 2-15 shows MEADS' role in layered missile defense.

Figure 2-15. MEADS Role In Layered Missile Defense



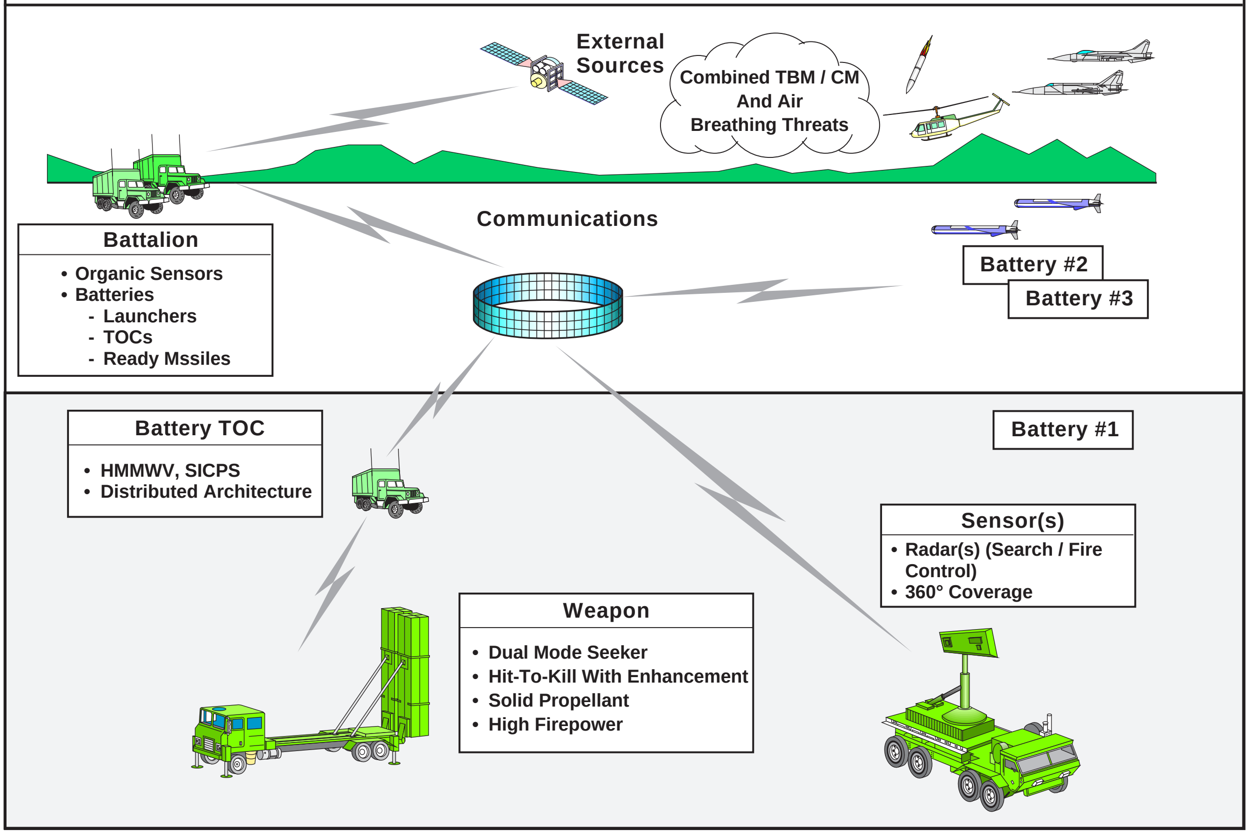
MEADS can be deployed as a single battle element/battery, or as a battalion operating from geographically displaced locations. Each battery contains a battery Tactical Operations Center (TOC), 360° sensor(s) for surveillance and fire control, and launchers with high firepower. The weapon is projected to be a hit-to-kill, dual pulsed solid propellant missile with lethality enhancement and a dual mode (IR/RF) seeker. All system components will be employed in a distributed architecture using high capacity tactical communications. Since each battle element/battery can operate autonomously, one battle element/battery can be moving with the maneuver forces while other batteries are defending vital assets.

External cueing from national and theater sensors is vital to the success of MEADS, especially against the low flying cruise missile threat. Over-the-horizon data from these sensors will allow MEADS to engage low flying cruise missiles at tactically significant ranges. Figure 2-16 is a conceptual drawing of the MEADS operational environment/battlespace.

FY 1996 efforts resulted in the following accomplishments:

- Completed negotiations and approved PD-V MOU;
- Established NATO MEADS Management Agency (NAMEADSMA) in Huntsville, AL;
- Awarded International Teaming Contracts.

Figure 2-16. MEADS Description



Work planned for FY 1997:

- Initiate PD/V phase;
- Begin negotiations for design and development phase MOU;
- Conduct system requirements review.

Work planned for FY 1998:

- Conduct SDR;
- Continue PD/V phase;
- Release design and development phase RFP.

2.9.3 Airborne Laser (ABL) Program

The ABL program entered the PD/RR phase in November 1996, which will demonstrate all necessary technologies required for acquiring, tracking, and killing theater ballistic missiles in the boost phase. This will be accomplished by building and testing the prototype ABL aircraft. The PD/RR phase will be completed in FY 2002 with lethality demonstrations against boosting TBMs. Following successful demonstrations, the program will proceed into a relatively short

EMD phase in FY 2003. Production will provide an Initial Operational Capability (IOC) with three aircraft in FY 2006 and a Full Operational Capability (FOC) of seven aircraft in FY 2008.

2.10 Battle Management/Command, Control, Communications, Computers, and Intelligence (BM/C^{4}I)

Interoperability in Battle Management/Command, Control, Communications, Computers, and Intelligence (BM/C^{4}I) is essential for joint TMD operations. Accordingly, BMDO continues to take an aggressive lead to establish an architecture that all the Services can build upon and is actively pursuing three thrusts, described below, to ensure an effective and joint BM/C^{4}I for TMD. The BMDO TMD BM/C^{4}I program integrates the C^3 components of multiple, independently developed programs into a single, cohesive, seamless system that realizes the maximum synergy of the combined weapons and sensor systems. The primary goal is to provide the warfighter with an integrated TMD capability with the interoperability and flexibility to satisfy a wide range of threats and scenarios. From its joint perspective, BMDO oversees the various independent weapon systems developments and provides guidance, standards, equipment, and system integration and analysis to integrate the multitude of sensors, interceptors, and tactical command centers into a joint theater-wide TMD system.

2.10.1 BM/C^{4}I Architecture

The TMD BM/C^{4}I architecture is built upon the existing and planned command and control structure for TAD. During FY 1996, the TMD Command and Control Plan (TMD C^2 Plan) received Joint Staff approval and included an operational architecture based upon the three primary functions of joint operations: planning, coordination, and execution. Deliberative planning occurs primarily at the higher levels of command and is generally non-real-time. Force coordination takes place at the tactical commander level (CRC, TAOM, TF TOC, CIC) and involves near real-time decisions. Execution is accomplished by the direct linkage of the sensor to the shooter to put metal on target and involves real-time actions. Figure 2-17 describes this spectrum of planning, coordination, and execution. The rapid timeframes associated with the execution of TMD require closely coordinated command and control for centralized planning and guidance with decentralized execution. To ensure optimized planning and guidance, BMDO is focused on accomplishing the horizontal linkages among the theater-level command and control centers that could be deployed in various combinations over time from one theater or contingency to another.

The TMD BM/C^{4}I architecture to support the operational architecture for planning, coordination, and execution is built around three overlapping networks: a Joint Planning Network (JPN), a Joint Data Network (JDN), and a Joint Composite Tracking Network (JCTN). The JPN is a non-real-time/near real-time network building upon the Global Command and Control System (GCCS) to support the centralized planning and guidance. The JDN is a near real-time network based primarily on the TADIL-J (JTIDS) datalink to provide overall situational awareness and weapon coordination. The JCTN is a real-time network to directly link sensors and shooters from all the Services to provide fire quality information to take full advantage of the synergy of multiple systems. The execution function will be supported by JCTN, which is a mix of the JDN and the Navy's Cooperative Engagement Capability (CEC). Figure 2-18 shows how these networks overlay on the operational functions. Note that the networks overlap. The highest priority for near term implementation is the JDN. Figure 2-19 shows an example of the participants in the JDN. All Services

Figure 2-17. Spectrum Of Planning, Coordination, And Execution

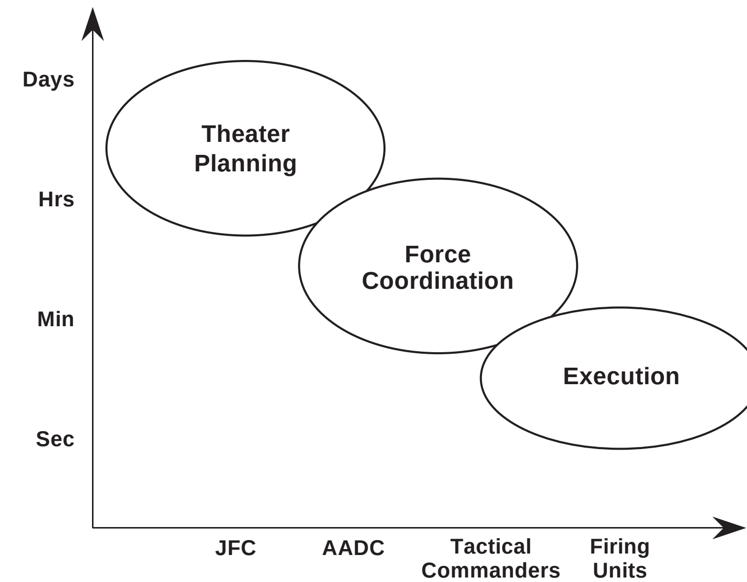
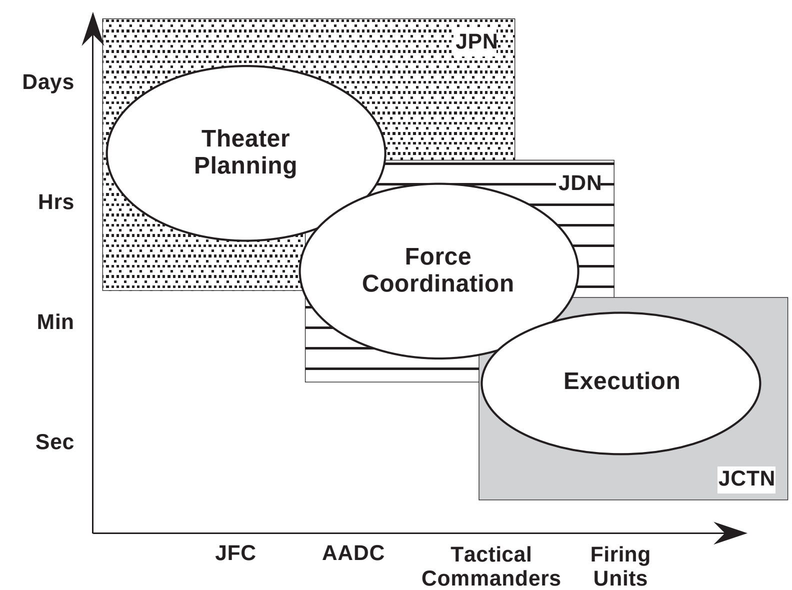
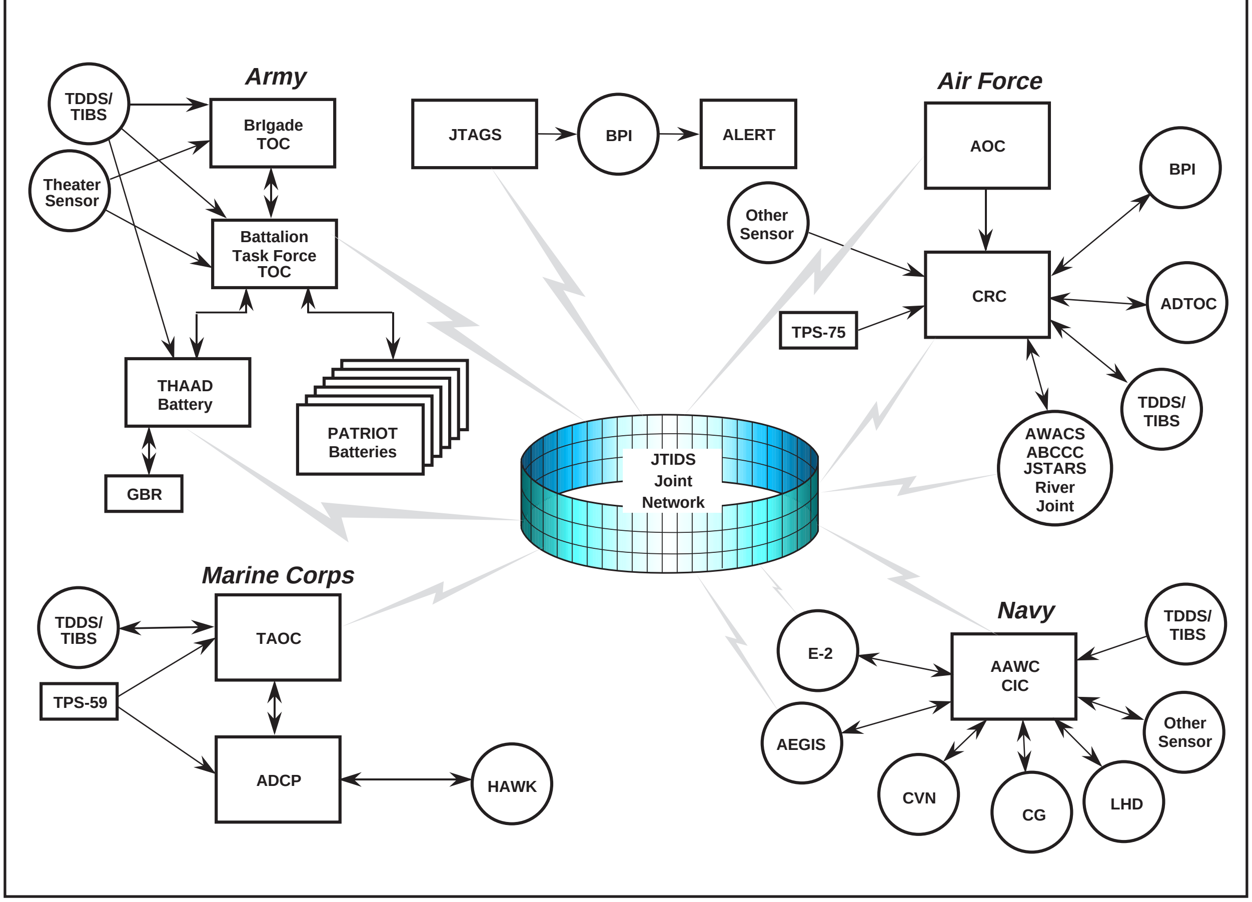


Figure 2-18. BM/C4I Networks



will interoperate via this net, which will allow early cueing of sensors and greater opportunity for TBM engagements. This joint data distribution will contribute to the success of engagements and mitigate leakage of hostile missiles through defenses.

Figure 2-19. BM/C4I Communications Network



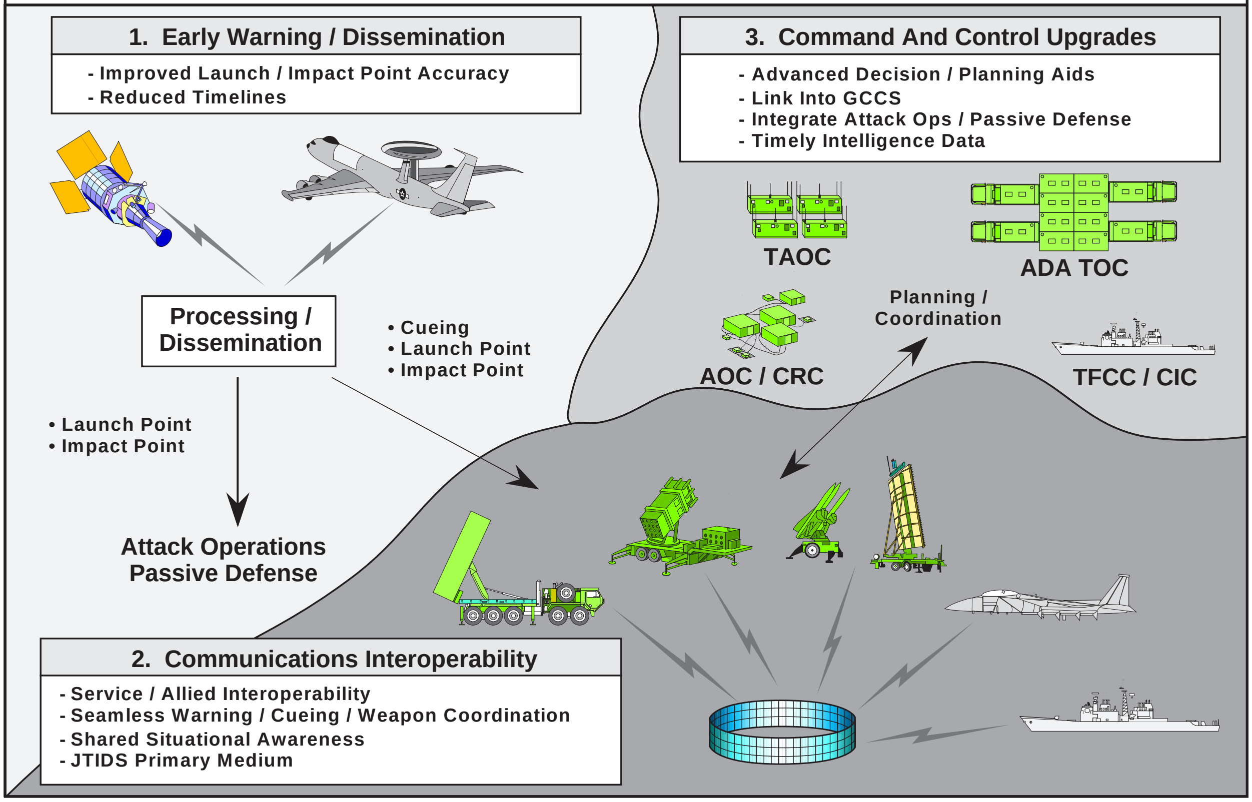
The intelligence portion of the architecture focuses on TIBS and TDDS. TIBS and TDDS are satellite broadcast systems which disseminate information from theater and national intelligence resources. TMD forces rely on TIBS and TDDS, in combination with the JDN, for receipt of launch warning information produced by tactical processors of DSP data (e.g., JTAGS in the theater or ALERT/TACDAR in CONUS).

2.10.2 BM/C^{4}I Thrusts

BMDO has three major thrusts to the TMD BM/C^{4}I program as illustrated by Figure 2-20.

The first thrust is to improve the timeliness and accuracy of early warning and track data from space and airborne IR platforms. The early cueing data can extend the target acquisition range of fire control radar systems, and in many cases increase the weapon system's shot opportunities and defended area. DSP was originally designed to detect strategic ballistic missile launches. To improve DSP performance for theater ballistic missiles, BMDO sponsored the Army/Navy-led Tactical Surveillance Demonstration Enhancement Program. The program prototyped a DSP stereo processing capability which formed the basis for the currently deployed JTAGS and ALERT ground processing stations. The Services now have responsibility for these fielded systems; however, BMDO continues to fund new cueing and warning-related technologies to further enhance the active defense, passive defense, and attack operations capabilities of TMD systems. JTAGS/

Figure 2-20. Three TMD BM/C4I Thrusts



ALERT have been integrated into the TIBS/TDDS networks to ensure timely dissemination of warning and cueing data directly to the shooter. JTAGS/ALERT and the TIBS/TDDS have improved Desert Storm warning data accuracy and timeliness by orders of magnitude. DSP will eventually be replaced by SBIRS and TIBS/TDDS will be replaced by the Integrated Broadcast System (IBS). BMDO is also working with the Services and USSPACECOM to minimize the impact to TMD systems during the transition.

The second thrust focuses on the need for a seamless, interoperable joint data net to rapidly exchange weapon coordination and cueing data and to provide the shooter and the tactical command centers with a consistent air and missile picture. This exchange of track data among units over a large area provides the ability to comprehend the battle situation beyond organic sensor range of individual participants, enhances organic radar acquisition by providing the means for cueing, and provides theater commanders with a consistent tactical picture for decision making. BMDO, with the Services and the Defense Information Systems Agency/Joint Interoperability Engineering Organization (DISA/JIEO), selected the Link-16 (TADIL-J) as the primary TMD datalink and successfully led a joint Service panel to define new data standards to support TMD. The standards have been joint Service and DoD agency-approved and have also been submitted for NATO acceptance. Several of these message standards have been approved by NATO for testing and BMDO has successfully tested the messages on the USMC ADCP. The program offices received the new standards described in the second thrust and are in the process of implementing the necessary software to integrate communication hardware with the various host platforms. BMDO continues to monitor and influence program offices acquisition activities to ensure JTIDS/Link-16 procurement and integration funding and timelines support TMD timelines.

BMDO sponsored an extensive study initiated in FY 1996 to determine the full value added by a system such as the Navy's CEC to TMD. The results of the study will help to better define the JCTN and develop an implementation strategy to satisfy this portion of the BM/C^{4}I architecture.

The third thrust focuses attention on command and control centers at the planning and coordination level of TMD above the weapon systems' C^2 centers. The first element of the thrust is the determination of the information that needs to be passed among these centers. BMDO is developing a TMD Information Architecture that defines the processes, data structure, and critical information exchange requirements for these centers. The next element is the development of software applications and tools to assist in the planning and coordination processes. The Joint National Test Facility (JNTF) is leading a Joint TMD Planner effort which will have common weapons characteristics of all the Services in its database and provide the means to provide TMD guidance for the executing activities in terms of such activities as defended asset lists and rules of engagement. This application will be consistent with and offered as an application for the GCCS. This thrust puts contingency deployable prototype C^2 centers in the field to enhance user experience and input regarding requirements refinement. A prototype TMD Cell for the United States European Command (USEUCOM) has been provided to the CINC, and similar cells will be provided to the United States Pacific Command (USPACOM) and the United States Central Command (USCENTCOM) to identify unique requirements in their areas of responsibility. Additionally, BMDO will join the Army efforts to field brigade-level Air Defense Tactical Operations Centers (ADTOC) and support the TMD aspects of this program.

BMDO is employing a Systems Integration and Interoperability contractor to help document and define the BM/C^{4}I Architecture. An Interoperability Description Document (IDD) will provide detailed descriptions of the interfaces and functionalities needed between each command and control node. A System Road Map will provide guidance on how and when each of the systems will achieve required interoperability.

In a continuous effort to validate the C^{4}I architecture and to measure the progress of the three BM/C^{4}I thrusts, BMDO is responsible for testing integrated BM/C^{4}I for TMD. This includes BMDO-sponsored exercises which will use the facilities of the JNTF and the Advanced Research Center (ARC) to refine the information architecture through user interactions, and quantifying performance parameters to be met by Service programs. Additionally, BMDO will use end-to-end simulations, man-in-the-loop tests, and Hardware-In-The-Loop (HWIL) tests to validate BM/C^{4}I requirements and determine that those requirements have been met. To meet the specific needs of TMD testing, System Integration Tests (SITs) have been defined which piggyback on live missile firings. Prior to and following a SIT, a series of HWIL tests will be conducted using the TMD System Exerciser (TMDSE) to simulate the operational environment and to drive each element participating via HWIL. As a distributed HWIL, the TMDSE stimulates the TMD data processors via a simulated environment to demonstrate TMD system responsiveness and performance as an integrated whole in scenarios unachievable with live-flight testing.

2.10.3 Theater Missile Defense BM/C^{4}I Integration Group (TBIG)

BMDO has established a broad-based IPT with participation by the Services, CINCs, and DoD agencies to work BMDO's integration and interoperability objectives. That group, the TMD BM/C^{4}I Integration Group (TBIG) meets regularly to share information and to secure the coordination and collaboration of all affected programs in defining and implementing the appropriate C^{4}I solutions for an integrated TMD capability. This information sharing helps identify divergences so that problems can be solved. The TBIG involves both operators and material developers in sharing information that supports Service activities pertaining to programmatic planning, standards, the TMD C^4I functional baseline, and interface control documentation. Participation by the unified CINCs, in addition to the Service user/operator representatives, provides a current user's perspective.

OSD and the Joint Staff are active TBIG participants. The OSD representatives ensure that initiatives pursued by the Services/agencies are in consonance with OSD policies for C^4I and information systems. The TBIG meetings also provide an opportunity for OSD to inform the Services/agencies of directives that apply to the TMD community. This exchange of information keeps all parties informed. The Office of the Joint Chiefs of Staff also sends representation to each TBIG meeting to share information on officially approved joint doctrine, CONOPS, and other efforts to improve worldwide C^2 systems (such as the GCCS) with which the TMD family of systems will eventually interface. The DISA/JIEO provides the technical expertise to implement and define the OSD and Joint Staff policies.

The TBIG has established subordinate working groups to investigate several issues. The TMD Subgroup of the Joint Multi-TADIL Standards Working Group is perhaps the most successful TBIG effort. The JTIDS Network Management Working Group is tackling the issues of managing the complex JTIDS network. The T4P Working Group is a forum to coordinate the sensor-to-shooter issues associated with TES, TACDAR, TIBS, and TDDS. A Risk Management group has been formed to focus on specific risk issues and means to eliminate or mitigate the effects of risks. The Information Architecture, previously mentioned, is being developed with the help of a working group established by the TBIG. All these groups provide the information sharing and issue resolution opportunities essential to produce an interoperable BM/C^4I system.

FY 1996 efforts resulted in the following accomplishments:

First Thrust: Launch Warning Dissemination.

- Developed multisensor tracking algorithm;
- Implemented situation targeting algorithms;
- Integrated C^2 connectivity to national assets.

Second Thrust: Communications Interoperability.

- Conducted modeling and analysis of JTIDS network structure in support of TMD;
- Developed interoperability certification test plan;
- Demonstrated lower-tier/Joint interoperability;
- Updated Information Exchange Requirements (IER);
- Began implementing JTIDS TMD message sets on selected BM/C^4I platforms. Started integration on Air Force platforms (Ground Tactical Air Control System, Cobra Ball, and Rivet Joint);

- Initiated study on relaying TMD data to theater areas beyond the line-of-sight limitations of a JTIDS network;
- Began work on AEGIS cruiser/JMCIS interface;
- Completed JTIDS TMD message set validation in North East Asia and South West Asia theaters;
- Defined joint JTIDS Range Extension (JRE) operational and demonstration architecture;
- Continued correlation analysis and testing as required in the Modeling, Analysis, and Simulation Center;
- Developed Data Link Handbook;
- Completed debris techniques analysis plan;
- Supported MIDS development.

Third Thrust: Command and Control Upgrades.

- Prototyped the decision support aids for JFACC battle management;
- Developed, simulated, and demonstrated prototypes of the recommended TBMCS application for the distributed command and control nodes;
- Completed testing of JTIDS Navy Command and Control Processor (C2P) modifications;
- Conducted TMD war game;
- Conducted tests to refine command and control procedures;
- Continued prototype integration into ADTOC weapon systems of BM/C^4I capabilities;
- Began implementation of TBMD modifications necessary for the Advanced Combat Direction System (ACDS);
- Refined Time Critical Target Aid (TCTA) prototype, began software integration into the Theater Battle Management Core System (TBMCS) databases;
- Conducted Distributed Battle Management (DBM) platform impact assessments on AWACS, JSTARS, and/or the Control Reporting Center;
- Began TMD intelligence planning tool development: completed one country study and started a second country study;
- Evaluated software maturity for operational tests;
- Integrated JTIDS into USMC ADCP;
- Initiated cue acceptance development for AN/TPS-59 and TAOM TMD upgrades.

Work planned for FY 1997:

First Thrust: Launch Warning Dissemination.

- Continue to integrate C^2 connectivity to national assets.

Second Thrust: Communications Interoperability.

- Participate in joint TBMD interoperability demonstrations;
- Demonstrate Army enclave interoperability;
- Integrate JTIDS into Army systems and additional Air Force platforms (complete AWACS TMD message set integration, start AWACS fleet upgrade, continue GTACS TMD message set integration, and begin Air Operations Center and Airborne Command and Control Capsule);
- Continue evolution of JMCIS/TBMD segment;
- Complete correlation analysis testing;
- Develop joint JTIDS Range Extension implementation plan.

Third Thrust: Command and Control Upgrades.

- Perform AOC/CRC upgrades for TMD;
- Begin software integration of TMD messages;
- Participate in TBMD workshops;
- Conduct C^2 tests to refine C^2 procedures;
- Continue implementation of TBMD modifications for ACDS;
- Complete TCTA software integration into TBMCS databases;
- Model and simulate the DBM system concept, begin DBM technology risk mitigation;
- Normalize intelligence preparation of the battlespace country studies;
- Continue TMD intelligence tool development, begin software integration into Combat Intelligence Systems databases;
- Integrate JTIDS into Army systems;
- Field Joint TMD Planner software V1.0.

Work planned for FY 1998:

First Thrust: Launch Warning Dissemination.

- Implement improved correlation software for TIBS/TDDS.

Second Thrust: Communications Interoperability.

- Definition of a point-to-point Link-16 STANAG;
- Complete the AEGIS/JMCIS interface control documents;
- Implement TADIL-J onboard the E-2C aircraft;
- Implement TADIL-J onboard additional Air Force platforms;
- Develop TADIL-J range extension software and hardware;
- Continue JTIDS procurement for JDN;
- Initiate actions for a JCTN;
- Distribute joint correlation analysis results and guidance;
- Continue AWACS JTIDS TMD message set fleet upgrade;
- Continue Ground Tactical Air Control System, Air Operations Center, and Airborne Command and Control Capsule TMD message set integration;
- Develop joint JRE capability in accordance with implementation plan.

Third Thrust: Command and Control Upgrades.

- Upgrade JMCIS TMD software segments;
- Field two Tactical Operations Centers to Active Army brigades;
- Field JTMDP V2.0;
- Develop an automated intelligence database function;
- Deliver TMD Battlefield Situation Display;
- Conduct initial testing of TAOM TMD modifications;
- Continue distributed battle management technology risk mitigation;
- Develop automated intelligence database function.

2.11 Other Programs and Concepts

Other programs and concepts include BPI and SBIRS. The following sections describe these activities. Figure 2-21 shows the active defense framework with some of these systems included.

2.11.1 Boost Phase Intercept (BPI)

BPI systems are designed to defeat TBMs in the powered portion of flight. This is a time critical phase of flight in which the BPI systems will detect, target, and destroy TBMs in a matter of seconds. Only in this boost phase can U.S. forces actively defend against TBMs and provide a significant deterrence not to launch WMD. With BPI, the enemy must face the potential of having chemical, biological, or nuclear weapons fall back upon its own territory. The ABL is being

Figure 2-21. TMD Active Defense Framework Core Programs And Other Concepts

	Land	Sea	Air
Upper	THAAD System (FUE FY 04; UOES FY 99)	Navy Theater Wide TBMD Initial Intercept FY 00 UOES / FUE TBD	Boost Phase Intercept - Airborne Laser (Air Force) - UAV BPI (BMDO)
Lower	PAC-3 Configuration Three (FUE FY 99) Corps SAM / MEADS	AEGIS With SM-2 Block IVA (FUE FY 02; UOES Software FY 98)	
BM/C^{4}I	JTAGS ALERT TACDAR	DSP	TPS-59

Core Program*

Other Programs And Concepts

* Emphasizes Programs Underway Or Upgrades To Existing / Fielded Systems

Combination Gives CINC Flexible Deployment / Employment Options

developed by the Air Force to accomplish BPI. The UAV BPI is being pursued as a backup to the ABL.

2.11.2 Kinetic Energy Boost Phase Intercept (KE BPI)

The primary objective of the KE BPI program has been realigned in an effort to develop and demonstrate lightweight endoatmospheric vehicle technologies to supporting advanced TMD interceptors.

2.11.3 Space Based Infrared System (SBIRS)

The SBIRS Program is an Air Force acquisition effort to develop and field a consolidated space-based nonimaging infrared surveillance system. The SBIRS Program is an essential element of the NMD architecture and while space-based tracking is not necessary to the operation of ground-, sea-, or air-based TMD systems, the deployment of SBIRS would enhance the capabilities of those systems. A deployed space-based midcourse tracking system will provide a significant extension of the range and effectiveness of TMD systems, and allow them to operate effectively under adverse conditions. Also, a space-based midcourse tracking capability may be needed to augment ground-based radars and extend the range of intercepts against the evolving longer range theater missile threats. Providing TMD systems with over-the-horizon sensor cueing will greatly enhance each system's performance. SBIRS data can be used to cue the radars (ground- or ship-based) to acquire warheads or it can be used to target the interceptors before the TBMs come within radar range. The additional battlespace gained with space-based midcourse tracking allows more shot opportunities, increases the probability of negating the threat, and allows the threat to be destroyed further from defended assets. This will decrease the probability of damage to friendly forces as a result of the intercept and otherwise allow warfighters to maintain the initiative.

For a more detailed discussion of SBIRS, see section 3.5.5.

2.12 Joint Force Activities

Joint force efforts include the Commanders-in-Chief (CINCs') TMD Assessment Program and Combined Warfare Activities. These efforts are discussed below.

2.12.1 CINCs' TMD Assessment Program

The CINCs' TMD Assessment Program consists of operational exercises, war games, Planning Exercises (PLANEXs), and Warfare Analysis Laboratory Exercises (WALEXs). This program enhances the two-way communication between BMDO as the developer and the warfighting CINCs who are the end users of TMD systems. In support of the user, the CINCs' TMD Assessment Program provides a vehicle for the CINCs to assess their capabilities and shortfalls so that they may refine and articulate their TMD requirements and improve their current and future TMD operational capabilities. The program facilitates the development and refinement of TMD doctrine and CONOPS as part of the CINCs' and Joint Staff's overall theater operations plans.

In support of the developer, the CINCs' TMD Assessment Program provides lessons-learned which are fed back into system requirements and the acquisition programs. In FY 1994, the program name was changed from the CINCs' TMD Experiments Program to the CINCs' TMD Assessment Program to emphasize feeding back lessons-learned into weapons system acquisition requirements, and Service and joint doctrine development. From BMDO's perspective, the program is a valuable vehicle for collecting the earliest data at a low cost on both current and future TMD system performance in a near tactical operational environment. Although the Joint Force Directorate is the BMDO point of contact for this program, all directorates within the BMDO Deputy for Theater Air and Missile Defense interact with and benefit from this program.

The objectives of the CINCs' TMD Assessment Program are:

- Improve current TMD capabilities;
- Document user TMD requirements;
- Facilitate development of TMD doctrine/CONOPS;
- Serve as the "bridge" between user and developer;
- Document existing TMD capabilities;
- Gain CINC support for BMDO programs.

To conduct the program, representatives from the CINCs' staffs participate in workshops where developers and the doctrine community brief the latest developments in their respective areas. The CINCs then develop prioritized goals based upon their past TMD experience and promising new technological and doctrinal developments. Working with BMDO's Joint Force Directorate, these goals are then translated into an assessment plan for the succeeding two years. The assessments are overlaid on established CINC/BMDO-sponsored WALEXs, war games, and live/simulated exercises to ensure that TMD capabilities are evaluated in the context of the full spectrum of joint and combined force operations. A BMDO-sponsored TMD PLANEX is made available to each CINC to provide, over a two-day period, basic instruction on the TMD pillars and operations, and to facilitate the design and conduct of TMD exercises and war plan preparation.

The results of the assessments provide operational data directly to the developer, and assist the CINCs in updating their integrated priority lists and operational requirements documents. Lessons-learned from these assessments support the development and refinement of TMD CONOPS; operational requirements; and joint, combined, and Service doctrine. The CINCs also gain valuable operational experience in conducting TMD operations, which immediately enhances the planning and execution of their warfighting capabilities and the development of TMD requirements for future weapon system deployments. The Joint Force Directorate ensures that lessons-learned are also presented to the acquisition community.

An increasing number of theater commands are participating in the program. From the program's inception in 1988 until 1993, USEUCOM was the only operational command to participate. In 1993, USCENTCOM and U.S. Forces Korea (USFK) joined. In 1994 U.S. Pacific Command (USPACOM) and U.S. Forces Japan (USFJ) began to participate as well. In 1995 U.S. Atlantic Command (USACOM) joined the program. BMDO provided liaison officers to help USACOM initiate TMD activities.

Major TMD CINC assessments include Optic Needle, Optic Cobra, Ornate Impact, and numerous war games. Optic Needle is the TMD portion of USEUCOM exercises and includes Central Enterprise, Optic Windmill, Matador (NATO exercise), Atlantic Resolve, Cold Fire (NATO Central Region Exercise), U.S.-U.K. Wargame, and Dynamic Mix (JTF/JFACC exercises). Optic Cobra is the TMD portion of Joint USCENTCOM exercises and includes Roving Sands. Optic Cobra assesses the ability of USCENTCOM to exercise all four pillars of TMD in both a live and simulated environment. Ornate Impact is the TMD portion of a USFK command post exercise which evaluates all four pillars of TMD in a simulated environment. The Joint Task Force Exercise series sponsored by USACOM is the template for increasingly complex TMD assessments. The USPACOM exercises focus on bilateral TMD issues throughout the Pacific basin and preparing U.S. Third Fleet Carrier Battle Groups for deployment to USPACOM and USCENTCOM.

In 1995, BMDO and USACOM concluded a memorandum of understanding establishing three BMDO liaison officer positions (Army, Navy, and Air Force) at USACOM. These billets provide USACOM with a TMD cell and the ability to participate more fully in the development and evaluation of joint, combined doctrine and requirements. Some of the specific liaison officer duties include planning coordination for USACOM/BMDO-sponsored CINC TMD assessments, planning and coordinating TMD war games, and working USACOM TMD issues and requirements.

2.12.2 Combined Warfare Activities

The Combined Warfare programs are joint programs with our allies and friends. These programs have three major objectives. The first objective is to reduce the costs of fielding TMD systems by sharing the cost burden of development, production, and operation. The second objective is to help our allies and friends understand the impact of the ballistic missile threat on their countries and to access innovative foreign technologies, systems, and unique capabilities. The third objective is to facilitate military ties to define common requirements to help ensure the interoperability of TMD weapon systems used by the United States, its allies, and friends. The FY 1994 Defense Authorization Act directed the Secretary of Defense to develop a plan to coordinate development and implementation of TMD programs with our allies which satisfies these objectives. BMDO prepared the plan, entitled "Report to Congress on Plan to Coordinate Development and Implementation of TMD Programs with Allies." The report was submitted to Congress in the fourth quarter of FY 1994.

In addition, the international cooperative programs support U.S. policies. The programs may strengthen U.S./allied mutual security commitments and counterproliferation policies and strategies. Fully developed programs should result in protection for U.S./allied forces and underpin the National Command Authorities freedom of action in crisis situations.

BMDO's approach is to build on the earlier foundation of bilateral research and development programs. These programs have led other countries to recognize existing and emerging threats of ballistic missile attacks. The strategy for international cooperation complements the TMD acquisition strategy for emphasizing near-term improvements, fielding the core programs, and developing advanced concepts.

2.13 TMD Test Program

TMD testing consists of individual MDAP testing and TMD "Family of Systems" (FoS) integration and interoperability tests. MDAP TMD test and evaluation efforts will be accomplished by the individual Service acquisition programs and will encompass all requirements mandated in DoD guidance. These test programs will be fully documented in each acquisition program Test and Evaluation Master Plan (TEMP). Testing to assure interoperability among systems acquired by an individual Service will generally be executed by that Service but will also be assessed in FoS testing. All tests, including tests of individual acquisition programs and TMD FoS, will be conducted in accordance with existing U.S. treaty obligations.

BMDO will sponsor testing to assure inter- and intra-Service operability and interoperability of the TMD Family of Systems with external systems. TMD FoS test requirements are derived from the *BMD Capstone Operational Requirements Document* (ORD), from individual system ORDs, and other documentation such as the TMD Command and Control Plan. TMD FoS requirements in the Capstone ORD include the responsiveness and effectiveness of the consolidated TMD FoS against specific tactical ballistic missile threats; characteristics of the common air picture which must be maintained among TMD C^2 centers; and specific information exchange requirements. Requirements not addressed in Service-specific test programs are included in the *TMD Capstone Test and Evaluation Master Plan (TEMP)*, which is a road map for future test planning and coordination among test programs, resources, and other organizations. Interoperability certification of each major acquisition program will be provided by the Joint Interoperability Test Command as required by DoD Directive 4630.5 and Chairman, Joint Chiefs of Staff Instruction 6212.01A.